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ACCELER8 PROGRAM

Certificate of Compliance

Date: July 6, 2006

Project Name: C-44 Reservoir/STA Project

Contract No. – Work Order No.: CN040918 – Work Order 12 Task 1.1.2

Deliverable Description: Preliminary Design Report Package

HDR Engineering, Inc. has completed preparation of the above referenced deliverable and herein submits it to the South Florida Water Management District's Acceler8 Program in accordance with the requirements of the referenced Work Order. It has been verified that this submittal includes all required components of the deliverable. Where required components are not submitted, an explanation and schedule for submitting the missing component(s) had been provided. Notice is hereby given that all quality control activities, appropriate to the level of risk and complexity inherent in the Project, have been completed. Compliance with established procedures as documented in the Project's Quality Control Plan submitted to the SFWMD has been verified.

Consultant Quality Manager

Name: John A. Ranon, P.E.

Signature: John A. Ranon **Date:** 7/6/06

Consultant Design Manager

Name: Barry J. Meyer, P.E.

Signature: B J Mey **Date:** 7/6/06

Consultant Project Manager

Name: C. Edwin Copeland, P.E.

Signature: C. Edwin Copeland **Date:** 7/6/06

ACCELER8
evergladesnow.org

2.0 INTRODUCTION

2.1 Project Background

The proposed C-44 Reservoir/Stormwater Treatment Area Project (Project) supports the goals and objectives of the Comprehensive Everglades Restoration Plan. This ambitious plan calls for the implementation of more than sixty projects over a period of thirty years and will cost an estimated 10.9 billion dollars. The overarching goal of the plan is to restore, protect, and preserve the water resources in a sixteen county area of central and southern Florida, including the Everglades. The goal will be achieved primarily by capturing excess surface water runoff that currently flows to the Atlantic Ocean and Gulf of Mexico and re-directing it to a series of impoundments for storage and treatment.

In 1850, Congress passed the "Swamp and Overflowed Lands Act" that conveyed all of Florida's swamp and overflowed land to the State of Florida with the stipulation that the sale of any land to private interests be utilized toward financing reclamation. Within seventy years of the enactment of this legislation, much of the northern and eastern Everglades were drained, primarily to increase agricultural production. In order to protect an increasing population and agricultural investments, the early drainage projects were expanded significantly, first by the state and then with the participation of the federal government through the Army Corps of Engineers (USACE). In 1948, Congress approved the Central and Southern Florida (C&SF) Project, which further expanded the regional network of canals, water control structures, levees and established a number of water conservation areas. To meet the program's multiple objectives (flood control, water supply for agricultural and urban areas, and prevention of saltwater intrusion, navigation, and water supply to the Everglades National Park, preservation of fish and wildlife, and recreation); the C&SF Project significantly altered a broad expanse of the region. Included among the major activities undertaken were the following:

- Channelization of the Kissimmee River
- Construction of dikes at Lake Okeechobee
- Draining of the portion of the Everglades immediately south of Lake Okeechobee (now known as the Everglades Agricultural Area)
- Construction of a drainage system in the lower east coast of the state to provide for urban, suburban, and agricultural development.
- Construction of dikes in the central portion of the Everglades to create water conservation areas

The work undertaken for the C&SF Project resulted in unintended adverse consequences for the south Florida ecosystem. To address these effects, both the state and federal governments have been working to correct, restore, and improve

natural systems while at the same time maintaining water supplies to serve urban and agricultural needs.

In 1996, Congress enacted a water resources act that authorized the USACE to review the C&SF Project. The Corps' comprehensive evaluation report, which became known as the Restudy, was submitted to Congress in July 1999. The Restudy recommended the implementation of a comprehensive restoration plan involving more than sixty major projects. In 2000, Congress passed another Water Resources Act, which approved the recommendations of the Restudy and authorized the construction of ten original projects.

- The program proposed by the Restudy and approved by Congress was defined as the *Comprehensive Everglades Restoration Plan* (CERP) within the Water Resources Development Act of 2000 (WRDA 2000). CERP serves as the framework for "the restoration, preservation, and protection of the natural system and provides for other water-related needs of the region, including water supply and flood protection".

The C-44 Reservoir/STA Project is a component of the Indian River Lagoon-South (IRL-South) Project Implementation Report (PIR) / Environmental Impact Statement (EIS) (March 2004) under the Comprehensive Everglades Restoration Plan (CERP). The Project is located in southern Martin County directly north of the C-44 Canal approximately half-way between Lake Okeechobee and the Atlantic Ocean (Figure 2.1). The C-44 Project was formulated to support specific performance measures of the IRL-South Project. Similarly, the IRL-South Project was formulated to support the performance measures of the CERP. The C-44 Project will assist, along with the other projects within the IRL-South, in achieving the performance measures and targets to regulate the timing of water delivered to the IRL and reduce nutrient inputs to sensitive receiving ecosystems such as the St. Lucie Estuary (SLE).

2.2 Status of the C-44 Reservoir/STA Project and Purpose of this Report

The studies, investigation and initial design efforts related to the implementation of the C-44 Project culminated in the preparation of the Basis of Design Report, which was submitted in draft form on January 13, 2006 and in final form on April 12, 2006. Subsequently, HDR was contracted to begin formal design and permitting of the project through the issuance of Work Orders 12 and 13, respectively. As of this date, the following design and permitting activities have been accomplished:

- Design – Troup Indiantown Water Control District (TIWCD) Temporary Reconfiguration
- TIWCD Preliminary Design Package – submitted on April 26, 2006
- Response to Review Comments, TIWCD Preliminary Design Package – submitted on May 26, 2006

- TIWCD Pre-final Design Package – submitted on June 6, 2006 (Final plans and specifications for the Reconfiguration package are due on July 31, 2006).
- Permitting – Troup Indiantown Water Control District Temporary Reconfiguration
    - o USACE 404 Permit – application submitted to SFWMD and USACE on May 2 and 3, 2006, respectively
    - o FDEP 1502 Permit – application submitted to SFWMD and FDEP on May 5 and 8, 2006, respectively

The District and HDR are awaiting review comments for both permit application packages.

The first submittal related to the design and permitting of the Main Project, meaning the Reservoir, Pump Station, Stormwater Treatment Area, and all related conveyance, distribution, discharge, and roadway improvements, is the subject of this report, the purpose of which is described in the next section.

2.3 Purpose

This report represents the first submittal of the design phase of the C-44 Reservoir/STA project. It contains the following information:

- A description of several significant basis of design changes that have occurred since the submittal of the Basis of Design Report,
- Provides updates of previously submitted information, e.g., surveying, hydrologic and water quality monitoring plan, and site characterization,
- Provides an update of permitting activities conducted to date,
- Provides an outline of the technical specifications that will be prepared in later design phases,
- Provides design calculations and computer modeling results that support the preliminary design effort,
- Provides an updated opinion of Probable Construction Cost and Project Schedule
- Provides the Preliminary Design phase construction plans

The Test Cell Analytical Report will be submitted separately during the Preliminary Design Phase.

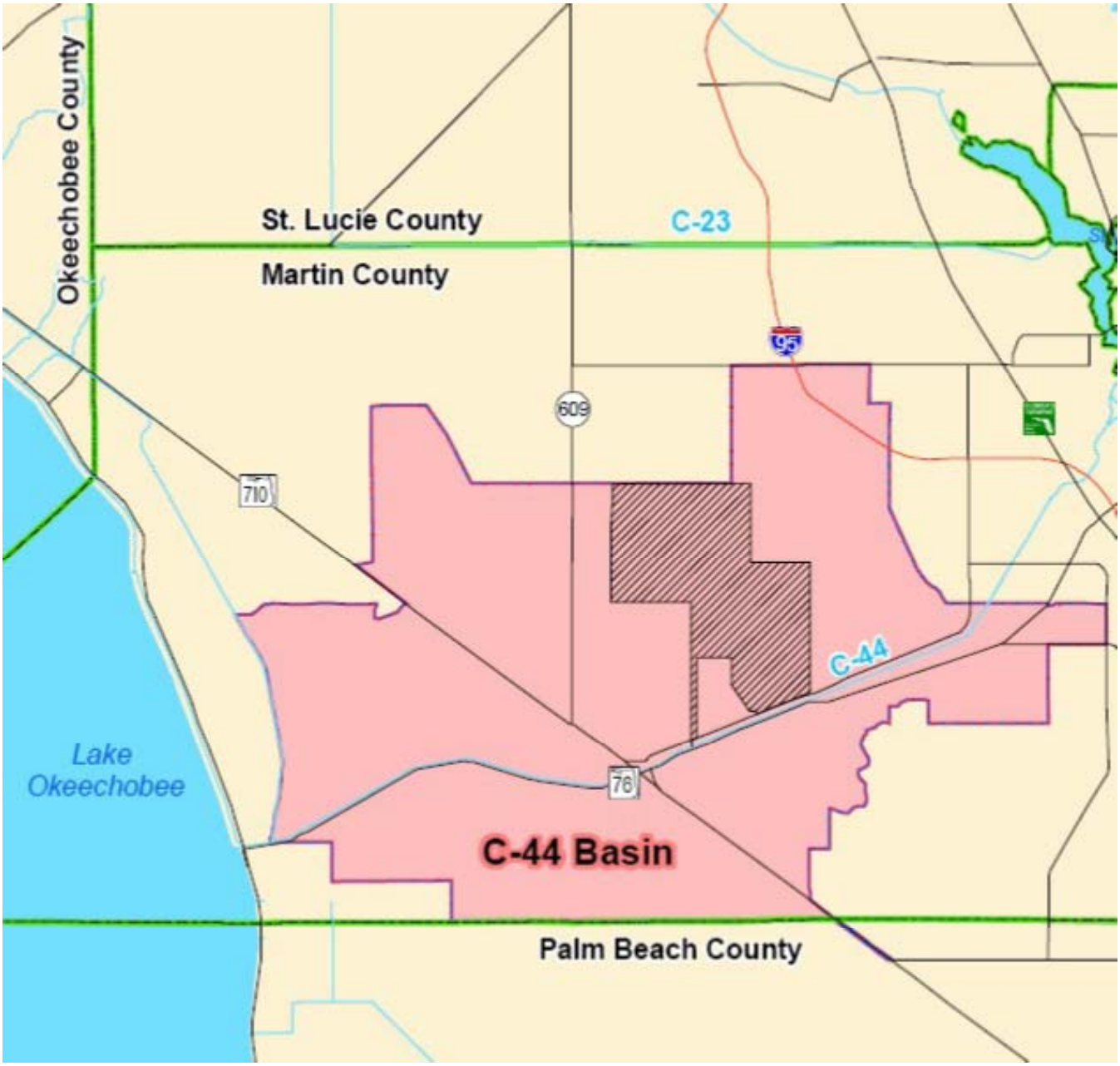
The Preliminary Design Report will be submitted for technical review to the project Design Review Team. HDR will prepare responses to the review comments utilizing the District's DrChecks review and response system. Additionally, HDR will participate with the District in a series of public stakeholder and Water Resources Advisory Committee meetings. Following the preparation of the review responses and the meetings, HDR will participate in a Technical Review Board briefing where it

is anticipated that final decisions will be made regarding unresolved specific project features so that the Intermediate and Final design can proceed.

The Preliminary Design Report Package for the C-44 Project is organized as a series of volumes as follows:

Volume 1 – Preliminary Design Report
2 – Pump Stations
3 – Reservoir and Stormwater Treatment Area
4 – Citrus Boulevard Improvements
5 – Opinion of Probable Construction Cost and Project Schedule

FIGURES



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Project Location

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/6/2006

FIGURE
2.1

3.0 BASIS OF DESIGN REPORT SUPPLEMENT

3.1 Introduction

The studies, investigation and initial design efforts related to the implementation of the C-44 Project culminated in the preparation of the Basis of Design Report (BODR), which was submitted in draft form on January 13, 2006 and in final form on April 12, 2006. The purpose of the Basis of Design Report was to further examine and evaluate the conceptual design developed for the C-44 Project as presented in the IRL-S Project Implementation Report. The BODR describes engineering analyses, refines the conceptual design, presents design criteria and cost estimates, and includes a detailed project schedule. The Project has since proceeded to the Preliminary Design Phase, which advances and refines the concepts of the IRL-South PIR and the BODR as described below.

This section of the Preliminary Design Report describes how the Project has evolved since the BODR was submitted and how it will be represented in the Preliminary Design. The following sections are sub-divided based on the major project elements that have been modified since the BODR submittal. Detailed descriptions of the analyses that support any modifications are presented in Volumes 2 through 5 of the Preliminary Design Report Package.

3.2 C-44 Reservoir/STA Project Site and Project Configuration

As presented in the BODR, the project site is currently in active citrus production. Swamp and marshland are located adjacent and to the north of the site, to the east of the northern portion of the site, and to the south of the site. The project site consists of approximately 12,000 acre tract as shown on Figure 2.1 (Section 2.0). Since the BODR was submitted, the Project site has undergone boundary changes due to the addition of lands northeast of the project, known as Minton and Star Farms, totaling 940 acres, and the future agreement to sell an “exchange parcel,” totaling 1,100 to 1,200 acres, to the current grove operator, Consolidated Citrus L.P. (CCLP) for continued citrus production. The SFWMD closed on the northeast 640 acres on May 31, 2006 and it is anticipated SFWMD will close on all other land agreements, including CCLP, in August, making the Project encompass approximately 12,160 acres. Other negotiations are in progress with the Troup Indiantown Water Control District (TIWCD), Martin County, Star Farms, and Florida and Power & Light (FPL). The TIWCD acquisition includes approximately 230 acres of roads and canals to be included within the Project boundary. The Martin County agreement serves to reconfigure a park/recreation location within the exchange parcel, which was previously conveyed to Martin County on January 31, 2006. With Florida Power & Light, the SFWMD plans to exchange approximately 8 acres adjacent to their existing sub-station for building a new distribution station, and dedicated service line to the Reservoir Pump Station for the Project. The Star Farms agreement will include the purchase of the remaining 300 acres in the northeast corner of the project.

The change in lands required modification of the Project configuration in a way that would optimize land use and still meet the project objectives. The modified Project configuration that will be the basis of the Preliminary Design is shown on Figure 3.1. The major modifications to the site layout include the following:

- Reshaping of the Reservoir to a more rectangular configuration
- Relocation of the discharge structure to the northeast end of the reservoir
- Removal of the reservoir internal dike, and
- Deletion of one STA cell while enlarging two other cells. Specific component modifications are summarized in the following sections.

3.3 Pump Station

The primary function of the C-44 Reservoir Pump Station will be to manage the supply of water to the Reservoir. The maximum rate will be 1,100 cfs which agrees with the rate previously established in the IRL-South PIR. Changes to the Reservoir Pump Station design since the BODR includes the following:

- The pumps will be electrically driven.
- The Pump Station site presented in the BODR was located in the embankment with a siphon discharge. The pump station has been moved outside of the embankment to reduce construction costs.
- A 72-inch diameter discharge pipe from each pump will have an invert elevation at the crest of the embankment of 43.0 ft NAVD.
- The water level in the suction bay after the screens ranges from an elevation of 8.0 ft NAVD to elevation 13.6 ft NAVD.
- Site electrical distribution is served directly from the FPL substation.
- The emergency generator will be 480 volts not 4,160 volts.
- Emergency power for the site distribution system will not be provided from the Pump Station.

Details of the Pump Station design are presented in Volume 2.

3.3 Reservoir Components

Reservoir components include the Reservoir, intake canal, the Reservoir discharge structure, the Reservoir seepage collection canal, and the Reservoir seepage collection canal outlet structure. Details design information for the Reservoir components are presented in Volume 3. A summary of the design changes for each of these components since the BODR are summarized below.

Reservoir

The Reservoir is located on the northwest portion of the project site (Figure 3.1). Although the layout has been reconfigured, the Reservoir water surface area remains at 3,400 acres, and the normal full storage level remains at EL 41. Changes to the Reservoir design since the BODR includes the following:

- Select on-site Unit C material may be used as part of the embankment drainage system.
- Geomembrane seepage control system is no longer considered an alternative.
- Conventional stair-step soil-cement without an internal bench is considered the most cost-effective alternative for reduction of wave run-up.
- Based on additional seepage analyses, using revised in-situ hydraulic conductivity values, a means to increase the factor of safety against piping is required and has been incorporated into the design.
- A range of hydraulic conductivity values for in-situ materials was used to evaluate potential seepage losses from the Reservoir.

Intake Canal

To deliver water from the C-44 Canal to the Reservoir, an intake canal will be constructed (Figure 3.1). The intake canal has been modified since the BODR from a bottom width of 40 ft to a bottom width ranging from 30 ft to 60 ft.

Reservoir Discharge Structure

A Reservoir discharge structure has been designed to convey water from the Reservoir to a distribution canal and to the individual STA cells. The Reservoir discharge structure was relocated since the BODR to the northeast corner of the Reservoir as shown on Figure 3.1.

Reservoir Seepage Collection Canal

A reservoir seepage collection canal is located around the Reservoir perimeter to collect and convey seepage from the Reservoir. The canal is also designed to convey water from the future C-23 connection. Specifically, the canal is located along the north, west and southern sides of the Reservoir (Figure 3.1). Changes to the Reservoir seepage collection canal design since the BODR includes the following:

- The bottom elevation of the reservoir seepage collection canal has been modified from 10 ft NAVD to 12 ft NAVD.
- The bottom width has been modified from 20 ft to 10 ft.

- A filter layer was added to increase the factor of safety against piping.

Reservoir Seepage Collection Outlet Structures

Seepage in the reservoir seepage collection canal is routed back to the intake canal through the reservoir seepage collection outlet structures (Figure 3.1). The outlet structures have been modified since the BODR as follows:

- The broad-crested spillway was modified; it has a crest length of 48 ft and a crest at EL 20 ft NAVD 88.
- A five-foot long adjustable weir gate with a crest elevation of 18 ft NAVD 88 is adjacent to the spillway.

3.4 Stormwater Treatment Area Components

Stormwater Treatment Area (STA) components include the STA cells, the distribution canal, the distribution canal auxiliary spillway, the seepage collection/STA discharge canal, and the site discharge structure (Figure 3.1). Detail design information for the STA components are presented in Volume 3. A summary of the design changes for each of these components since the BODR are summarized below.

STA Cells

The STA Cells for the Project encompasses approximately 6,474 acres and is designed to reduce the nutrient load of the waters that flow through the individual cells. Changes to the STA Cell design since the BODR includes the following:

- The STA cell layout was reconfigured since the BODR and now has seven separate cells (Figure 3.1). The total embankment length for the STA cells is approximately 166,700 linear feet.
- Flow into the STA cells is from the distribution canal through gated culverts and flow out of the STA cells is over weir structures. Three gated culverts and three weirs are located at each STA, except for STA 3, which includes two gates and two weirs.
- The outlet weirs have been modified since the BODR by removing the equalization basins downstream of the weirs and replacing them with two 4 ft by 4 ft box culverts. The weir structure design allows the addition or removal of plates so the water elevation of the STAs can be adjusted.

Distribution Canal

The distribution canal is designed to deliver water to the STA cells in such a manner that the cells can be maintained at the appropriate water levels and flow rates. Flow from the Reservoir through the discharge structure is conveyed via two 7 ft x 7 ft box

culverts through the embankment to the distribution canal (Figure 3.1). Changes to the distribution canal design since the BODR includes the following:

- The distribution canal was re-routed due to the relocation of the discharge structure and cell configuration.
- The bottom elevation of the distribution canal was lowered slightly since the BODR from 19.5 ft NAVD 88to 18.5 ft NAVD 88.
- The maximum water elevation in the distribution canal is 30.8 ft NAVD 88.

Distribution Canal Auxiliary Spillway

The auxiliary spillway, with a capacity of 600 cfs, bypasses flow to the seepage collection canal when water is released from the discharge structure and all STA inlet structures are inadvertently closed (Figure 3.1). Changes to the distribution canal auxiliary spillway design since the BODR includes the following:

- The auxiliary spillway with a 60-ft broad-crested spillway has been relocated to the end of the distribution canal east of STA Cell 3 (Figure 3.1).
- The spillway transition to the STA seepage collection canal has a crest elevation of 28.8 ft NAVD.

Seepage Collection/STA Discharge Canal

Flow from the STA cells is routed to the seepage collection/discharge canal (Figure 3.1), which conveys water to the offsite discharge. Changes to the seepage collection/STA discharge canal design since the BODR includes the following:

- The discharge to the C-44 Canal occurs only through the western outlet canal (Easement 3).
- The layout of the canal was revised to fit the new site configuration.
- The bottom elevation (12 ft NAVD) and bottom widths (10 to 60 ft) have been modified since the BODR.

STA System Discharge Structures

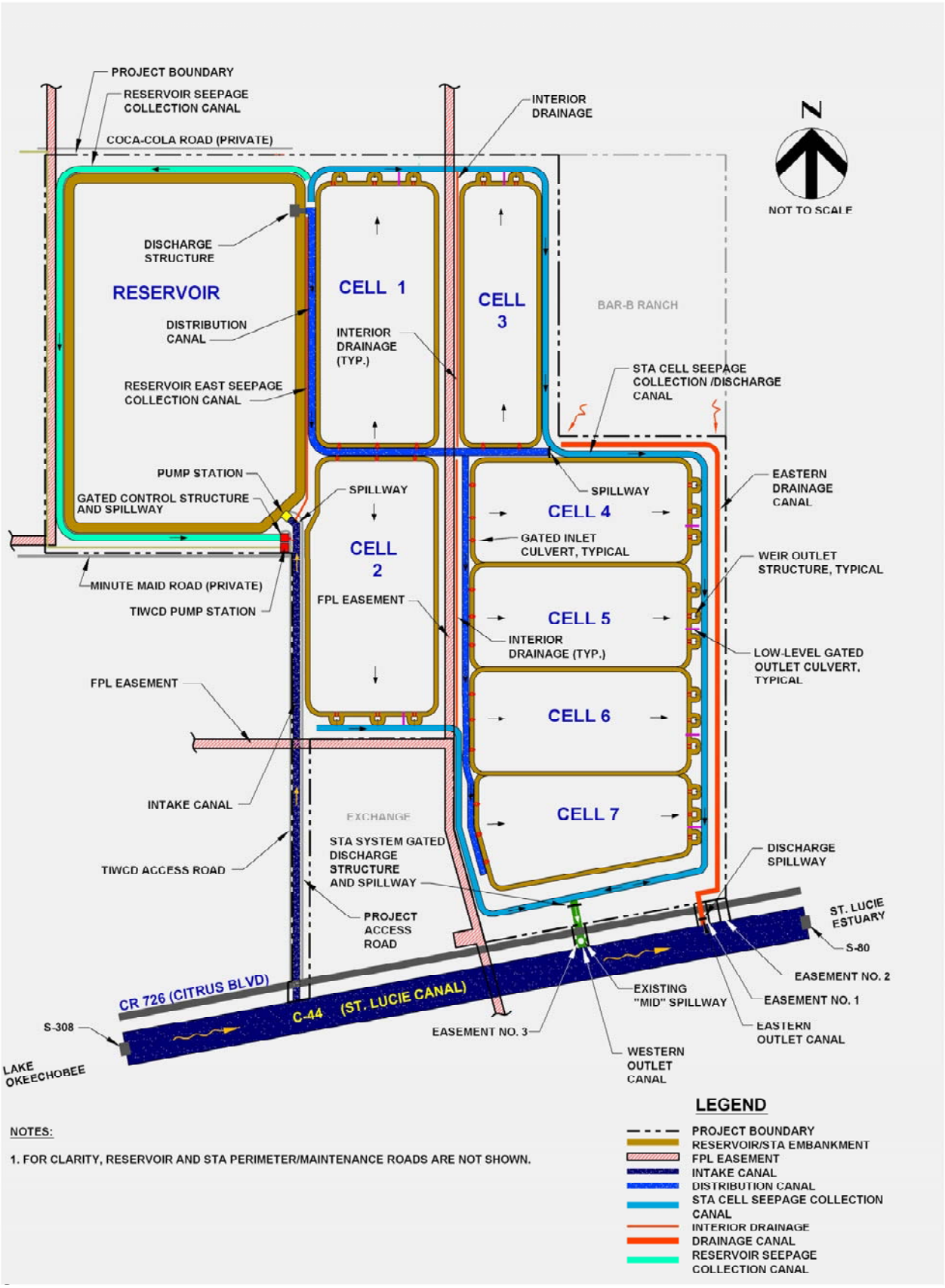
Discharge from the Project to the C-44 Canal will be through a 120-ft broad-crested spillway and adjacent to two 15-foot wide vertical roller gates at the western outlet canal, Easement 3 (Figure 3.1). The crest elevation of the spillway is 19.5 feet NAVD and the crest elevation of the gate sill is 16.0 feet NAVD. Easement 1 will no longer be used for site discharge.

3.5 Hydrologic and Water Quality Modeling

Hydrologic and water quality simulations for the Project were re-run during the Preliminary Design to account for the new Project configuration (additional STA acreage), to evaluate project performance without the C-23 diversion, and to evaluate project performance using actual flow data measured at S-308 instead of WaSh model generated flows.

The hydrologic and water quality evaluation involved the use of several numerical models to evaluate the following: 1) watershed flows, 2) a water budget, 3) phosphorus removal in the reservoir and STA, 4) nitrogen removal in the STA, and 5) evaluating the behavior of several water quality parameters in the reservoir, and 6) predicting seepage losses and potential off site impacts. A description of the modeling performed and the results are included in Appendix A.

FIGURES



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Project Layout Schematic

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/6/2006

FIGURE
3.1

4.0 C-44 PERMIT STATUS UPDATE

4.1 Test Cell Program

The Florida Department of Environmental Protection (FDEP) and U.S. Army Corps of Engineers (USACE) have issued permits for Test Cell construction. The FDEP 1502 permit was issued as an exemption and the USACE 404 permit application was issued as a Nationwide permit.

4.2 Temporary Reconfiguration of Troup-Indiantown Water Control District Facilities

Permit applications were submitted to the FDEP and USACE in May of 2006 for the temporary reconfiguration of the Troupe Indiantown Water Control District's (TIWCD) system of irrigation and drainage canals. Comments and/or request for additional information from the FDEP are expected to be forwarded to the District in early July, 2006. Although the USACE does not have a specified period of review, it is expected that comments will be provided to the District in a timely manner.

4.3 C-44 Reservoir/STA Project

Submittal of the 404 permit application to the USACE for the C-44 Reservoir/STA project is scheduled for late June or early July 2006. Submittal of the 1502 permit application to the FDEP is scheduled for July 13, 2006.

A Bridge Project Questionnaire was completed and sent to the U. S. Coast Guard. Based on a response letter dated April 21, 2006, a bridge permit will not be required from the Coast Guard.

If required, permit applications for gopher tortoise (*Gopherus polyphemus*) take or relocations will be completed. An incidental take permit for the eastern indigo snake (*Drymarchon corais couperi*) may be required. Coordination with the U.S. Fish and Wildlife Service is ongoing.

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5.0 DRAFT PROJECT OPERATIONS MANUAL

5.1 Introduction

This section presents a Preliminary Draft Project Operating Manual (POM) that will ultimately be utilized by operations personnel for day to day use in water management for essentially all foreseeable conditions affecting the C-44 Reservoir/STA Project (Project). An initial version of the POM was presented in the *Final Basis of Design Report* (BODR) submitted to the District in April 2006. This version of the POM takes into account an update of the Project layout and components as represented in the Preliminary Design, structure naming conventions, and refinements to the anticipated facility operations criteria since the BODR.

As discussed in the Comprehensive Everglades Restoration Plan (CERP) Program-Wide Guidance Memorandum #5 (CGM #5, April 2005), further development of the POM will involve an iterative process that will continue throughout the life of the Project. The Draft POM will be updated at specific intervals during the design, construction, and operational testing and monitoring phase (OTMP) of the Project. Refinements to the operating criteria in the Draft POM will be made as more design details, data, operational experience and information is gained during these phases. It is also anticipated that once the POM is completed and the long term operations and maintenance phase is underway, it may be necessary to revise the POM based on additional scientific information gained during monitoring and management, new CERP or non-CERP activities being implemented, new CERP updates, etc.

The anticipated points of update and revisions to the POM are as follows:

- Intermediate Design Phase
- Pre-Final Design Phase
- Draft POM for operations during construction
- Draft POM for the operational testing and monitoring phase
- Completed POM
- Revisions to the POM during long-term operations and maintenance

This section will be converted to a stand-alone Draft POM at the end of the Project design phase. As updates and revisions are made to the POM, individual revised pages will be clearly identified with the date of the latest revision. As a POM is revised, each previous iteration of the manual will be archived to provide historical continuity for project operations as required per GM #5. This is the first revision of the Preliminary POM since the BODR.

5.2 General Project Purposes, Goals, Objectives and Benefits

The C-44 Reservoir/STA Project is a component of the Indian River Lagoon-South (IRL-S) Project Implementation Report (PIR) under the Comprehensive Everglades Restoration Plan (CERP). The proposed reservoirs and stormwater treatment area (STA) facilities in the IRL-S PIR are intended to regulate the timing of water delivered to the IRL and reduce nutrient inputs to sensitive receiving ecosystems such as the St. Lucie Estuary (SLE). Land conversions from agricultural uses to Reservoir/STA land uses are also expected to contribute to a net reduction in nutrient loads. Salinity regulation is at the top of the list of proposed goals for the SLE (IRL-S PIR p. 1-11). Improved overall water quality in the SLE and IRL follows as a close second priority.

The C-44 Project components were formulated to support specific performance measures of the IRL-South Project. The C-44 Project is expected to provide water quality treatment and flow attenuation benefits, but it alone will not accomplish all of the performance measures of the IRL-S PIR. The primary goals and objectives of the C-44 Project per the IRL-South PIR are:

- Provide a minimum of 33,150 acre-feet of storage capacity (p.7-8)
- Attenuate peak C-44 Basin flows to the St. Lucie Estuary (pp. L-5, A-311)
- Reduce average annual phosphorus load by 36 metric tons including reductions from land conversion and irrigation (p. A-370)
- Reduce average annual nitrogen load by 108 metric tons including reductions from land conversion and irrigation (p. A-370)
- Provide level of service for irrigation demand of 2 in 10 years (p.6-77)

The project goals are based on a future condition as specified in the PIR, where a significant reduction in the number of Lake Okeechobee regulatory releases compared to existing conditions is anticipated due to the implementation of the CERP projects. The inclusion of inflows from the C-23 Basin to the C-44 Project is assumed in the goals listed above. In reality, the C-44 Project will operate initially with Lake Okeechobee regulatory releases at the current frequency until other components of the CERP are in place. In addition, the C-23 diversion will be implemented at a later date.

5.3 Project Features

The C-44 Basin has a contributing drainage area of approximately 202 square miles. The primary conveyance that serves the basin is the C-44 Canal (also known as the St. Lucie Canal). Flow in the canal is controlled by two major structures located on either end of the canal. At Lake Okeechobee, S-308, which is operated by the U.S. Army Corps of Engineers (USACE), controls flow from the Lake and is governed by the Lake Okeechobee Water Control Plan (LOWCP, USACE, 2000). In general, the LOWCP provides operating criteria for gate and lock operation. At the eastern end

of the C-44 Canal are the S-80 control gates and lock system. This facility, which is also operated by the USACE, serves both to provide flood control for the C-44 Canal watershed and to moderate water quality and flow to the estuary.

The C-44 Project will be an added component to the C-44 Basin and will consist of a Reservoir to capture flow from the C-44 Canal and STA cells to treat the inflow. Inflow to the Reservoir from the C-44 Canal will be through an intake canal and pump station located in the southeast portion of the Reservoir. Water will be discharged from the Reservoir through a gravity discharge structure to a distribution canal that will deliver water at a relatively uniform elevation to the STA inlets. Water to the STA cells from the distribution canal will be controlled with gated culverts. Two to three gated culverts are required for each STA to maintain a relatively uniform flow into the STA cells. A spreader swale will be constructed within each STA to equalize the water flow. Discharge of water from the STA cells to the seepage collection/discharge canal will be regulated with adjustable weir outlet structures. Water will be discharged from the seepage collection/discharge canal to the C-44 Canal at one discharge location at Easement 3. Project components are shown on Figure 3.1, and Project structures are shown on Figure 5.1 and listed on Table 5.1. The C-44 site structures have been named according to the USACE number system assigned during the PIR. The proposed structure identification numbers are shown on Table 5.2. Project components are described below.

5.3.1 Intake Canal

To deliver water from the C-44 Canal to the Reservoir an intake canal will be constructed. The intake canal will be approximately 20,000 feet in length running north-south along the western property boundary in an area now occupied by an existing Troup Indiantown Water Control District (TIWCD) irrigation canal. Removal of the TIWCD canal is to be compensated by modifications to the TIWCD system. The design criteria used for the intake canal is for a flow of 1,100 cfs and velocities less than 2 feet per second. Water from the C-44 Canal will be pumped from the intake canal and into the Reservoir based on the stage of the C-44 Canal and other considerations set forth by the LOWCP. The preliminary pumping schedule is shown in the table below.

C-44 Canal Water Level		Maximum No. of Pumps	Normal Pumping Capacity cfs
Ft NGVD	Ft NAVD 88		
14 or greater	12.6 or greater	4	1100
13.5	12.1	4	1100
13	11.6	4	1100
12.5	11.1	3	825
12	10.6	3	825

The intake canal is designed so that a maximum of three pumps can be operated at a minimum C-44 Canal elevation of 12 feet NGVD (10.6 ft NAVD). Although this pumping scenario is not anticipated to occur on a regular basis, the design allows for

changing conditions within Lake Okeechobee and the C-44 Canal as additional CERP projects come on line and the goal of the LORSS to reduce Lake Okeechobee levels are implemented.

5.3.2 Reservoir Pump Station (S-401)

The pump station will be located at the northern end of the intake canal (Figure 3.1), and will consist of four electrically driven pumps each having a capacity of 275 cfs. Pumps of identical size would provide the advantage of parts interchangeability and ease of operation. Also, this arrangement would provide 75% of the station design capacity with one pump out of service. The maximum flow rate to deliver water to the Reservoir is 1,100 cfs. This flow rate should be sufficient for both C-44 basin flows and a combination of C-44 and C-23 basin flows, when the C-23 diversion canal flow is added.

The pump station will be located outside of the embankment. The water level in the suction bay after the screens ranges from an elevation of 8.0 ft NAVD 88 to elevation 13.6 ft NAVD 88. The pumps will take suction using a Type 10 Formed Suction Inlet (FSI) to minimize pump submergence and discharge to a Reservoir having water levels ranging from EL 27 ft NAVD (the floor of Reservoir is at Elevation 26 ft) to EL 41 ft. The 72-inch discharge pipe from each pump will have an invert elevation at the crest of the embankment of 43.0 ft. During startup the pumps will lift the water to the siphon crest and vacuum pumps will evacuate the air to establish the siphon. The 72-inch pipe will terminate in a structure at the floor of the Reservoir. The structure will have an overflow weir set at Elevation 27.0 ft to maintain a flooded discharge to enable the siphon at all Reservoir elevations.

5.3.3 Reservoir

The Reservoir will be located within the northwest portion of the site (Figure 3.1). The wet area at normal pool elevation is approximately 3,400 acres. Storage capacity within the Reservoir is estimated at 50,930 acre-feet at a Normal Full Storage Level (NFSL) of 15 feet (41 ft NAVD 88).

The Reservoir will be filled by the pump station when water is available in the C-44 Canal and there is available storage capacity in the Reservoir. As noted above, the NFSL within the Reservoir will be 15 feet (EL 41.0 ft NAVD 88). Water can be discharged through the discharge structure (discussed below) for the normal operating range of EL 26.0 to 41.0 ft NAVD 88.

5.3.4 Reservoir Seepage Collection Canal

A reservoir seepage collection (RSC) canal will be located around the Reservoir perimeter. Specifically, the RSC canal is located along the north, west and southern sides of the Reservoir (Figure 3.1). Seepage in the RSC canal will be routed back to the intake canal through the RSC outlet structure, which consists of a 47.5 foot long broad crested spillway with a crest elevation of 20 feet NAVD and a 5 ft wide variable weir gate with an adjustable crest elevation of 18.0 to 20 ft. The goal of this

canal is twofold. First and foremost, the RSC canal is designed and located to provide protection to adjacent land from the potential adverse impacts of seepage. Additionally, the RSC canal will be sized to accommodate flows from the C-23 Canal system in anticipation of a future planned connection and rainfall runoff from the Reservoir embankment slope.

5.3.5 Discharge Structure (S-402)

A discharge structure will be located in the northeast corner of the Reservoir (Figure 3.1). The purpose of this discharge structure is to provide and control the flow from the Reservoir to the distribution canal and STA cells.

The discharge structure consists of a tower structure with side walls of 27 feet in width. Three 6 ft by 6 ft remotely operated gates will be utilized to control the rate of discharge from the Reservoir. The three gates are provided so that a normal design flow of 600 cfs and a maximum design flow of 1,100 cfs can be maintained using just two of the gates. This provides redundancy to allow control even if one of the gates is non-operational. The discharge tower structure is connected to the distribution canal through two 7 ft by 7 ft box culverts. Gates on the end of the box culverts inside of the discharge structure can be closed if necessary for repair and maintenance of the discharge structure. These box culverts provide sufficient hydraulic capacity to assure adequate flow from the discharge structure during normal operations. There are three 14-ft long emergency service spillways located at EL 41 ft NAVD 88 in the tower.

5.3.6 Stormwater Treatment Area

The Stormwater Treatment Area for the Project encompasses approximately 6,400 acres configured as seven separate cells. The total embankment length for the STA cells is approximately 166,700 linear feet. Flow into the STA cells is from the distribution canal through gated culverts, and flow out of the STA cells is over weir outlet structures. The weir structure design allows the addition or removal of plates so the water elevation of the STAs can be controlled. The targeted average depth within the cells is 1.5 ft. The total flow is proportioned to each cell by area. The inlet and outlet structure numbers are included in Table 5.2.

5.3.7 Distribution Canal

Flow from the Reservoir through the discharge structure is conveyed through two 7 ft x 7 ft box culverts through the embankment to the distribution canal. Primarily, the distribution canal is designed to deliver water to the STA cells in such a manner that the cells can be maintained at the appropriate water levels and flow rates. The distribution canal has been sized to allow flow from the Reservoir to the STA cells at the maximum rate expected. In general, the canal is designed to pass the normal design flow rate of 600 cfs, and maximum design flow of 1,100 cfs, with minimal head loss.

5.3.8 Distribution Canal Auxiliary Spillway (S-405)

The distribution canal has the capacity to convey 600 cfs to an auxiliary spillway, which bypasses flow to the STA seepage collection/discharge canal when all STA inlet structures are closed (Figure 3.1). The auxiliary spillway is located at the end of the distribution canal east of STA Cell 3 (Figure 3.1). A 60-ft broad-crested weir (spillway) is located at the end of the distribution canal. The spillway transition to the seepage canal has a crest elevation of 28.8 ft NAVD 88.

5.3.9 Seepage Collection/STA Discharge Canal

Flow from the STA cells will be routed to the seepage collection/discharge canal (Section 3, Figure 3.1), which conveys water back to the C-44 Canal. The canal bottom elevation is designed at 12 ft NAVD 88, and the required bottom width varies from 10 to 60 feet.

5.3.10 Site Discharge Structures (S-404A, S-404B)

Discharge from the Project to the C-44 Canal will be through a 120-ft broad-crested weir with two 15-foot wide vertical roller gates at Easement 3 (Section 3, Figure 3.1). The crest elevation of the spillway (S-404A) is 19.5 feet, and the crest elevation for the gates (S-404B) is 16 feet NAVD 88.

5.3.11 Interior Drainage Canals

Florida Power and Light (FPL) has existing easements within the Project site (Section 3, Figure 3.1). An interior drainage canal will be constructed to drain water from the north-south FPL easements to the STA seepage collection canals.

5.4 Factors Affecting Project Operational Strategy

The project operations strategy will be dependant upon a number of factors, including the stage in the C-44 Canal, the stage in Lake Okeechobee, the conditions at S-80, and the conditions in the St. Lucie Estuary, all of which are controlled primarily by seasonal and short-term climatic conditions. The C-44 Project operational strategy will include integration with the existing components in the basin as discussed in the following sections.

5.5 Project Relationships and Interactions

The S-308 and S-80 structures are operated based on the LOWCP (July 2000). The Interim Regulation Schedule for Lake Okeechobee incorporates tributary hydrologic conditions and climate forecasts into the operational guidelines. The regulation schedule is known as the “WSE” (Water Supply Environment), and was developed to provide increased operational flexibility and to optimize environmental benefits with minimal or no impact to competing Lake uses.

The WSE schedule has multiple operational Zones (A through E) which correspond to Lake Okeechobee stages throughout the calendar year (Figure 5.2). Discharges at higher lake stages (Zone D and above) are determined based on meteorological forecasts, climate outlooks, effects to ecosystems, and review of regional hydrologic conditions. Technical information is provided by a group of interdisciplinary scientists, engineers and resource managers, and release decisions are made by the USACE, following the WSE guidelines. At lower lake stages (below Zone D) there are minimum flows and levels criteria for protection from significant harm to the water resource. There also is Supply Side Management, where water deliveries from the Lake for consumptive use may be constrained by criteria set forth in the Lake Okeechobee Supply Side Management Plan (SFWMD 1991), as modified in the Lower East Coast Water Supply Plan (LECRWSP, SFWMD 2000a).

Within the WSE is an Operational Guidelines Decision Tree for discharge to the estuaries, which is included as Figure 5.3. The operational flexibility of the WSE schedule allows for adjustments to be made in the timing and magnitude of Lake Okeechobee regulatory discharges based on conditions in the lake and in tributary basins, and on extended meteorological and climate outlooks. For example, if the outlook suggests that drought conditions are likely, water might be held in the lake; if the outlook suggests higher than average rainfall, water might be released. The decision criteria in Figure 5.3 are the starting points from which operational decisions are made. Adaptive Protocols are proposed to be implemented where the WSE schedule indicates that water must be released from the lake, but does not indicate the exact amount. Adaptive Protocols are also proposed when the LOWCP authorizes releases of water from the Lake for water supply, fish and wildlife protection, and salt water management.

Regarding the WSE, the USACE is the lead of an interagency study team undertaking the Lake Okeechobee Regulation Study Schedule (LORSS), an environmental Impact Study (EIS) with the goal of revising the WSE schedule for the Lake by January 2007. The objectives of the study are to: 1) manage Lake Okeechobee at optimal levels to allow recovery of the Lake's environment and natural resources, 2) Reduce high flow regulatory releases to the St Lucie and Caloosahatchie estuaries, and 3) continue to provide flood control, water supply, navigation, and recreation water resource needs.

The study also incorporates RECOVER performance measures for the Lake and St. Lucie Estuary. The Lake Okeechobee performance measure is to establish gradual stage recession patterns from near elevation 15 ft NGVD from November to January, to elevation 12.5 in June and July, with a gradual rise in stage from fall to winter. The performance measure also seeks to reduce the number of extreme low lake stages below 10 ft NGVD, and reduce the number of extreme high lake events above 17 ft NGVD. The navigation performance measure is to minimize the number of low lake stage elevations below 12.56 to maintain an 8-foot navigation depth in the lake. The EIS is considering three alternative plans to adjust the WSE schedule to meet the performance measures. Coordination by the District with the LORSS study team will be required to incorporate the C-44 Project into the new Lake Okeechobee Water Control Plan.

The SFWMD has defined a process, termed Adaptive Protocols for Lake Okeechobee Operations, for implementing opportunities for operational flexibility that exist in the WSE schedule that address non-regulatory releases of water for fish and wildlife protection and salt water management. The Lake Okeechobee & Estuary Recovery (LOER) Plan has been developed to help restore the ecological health of Lake Okeechobee and the St. Lucie and Caloosahatchee Estuaries. The overall purpose of the Adaptive Protocols is to provide information to system operators for greater protection of Lake Okeechobee and downstream ecosystems, while continuing to provide a reliable supply of water for agricultural and urban areas that depend on the Lake. In addition, an action plan, identified Key state agencies charged with carrying out the plan include the SFWMD, the Florida Department of Environmental Protection (FDEP), the Department of Agriculture and Consumer Affairs (FDACS), and the Department of Community Affairs (FDCA). One charge of the LOER Plan is to review and make recommendations to the USACE to improve the WSE schedule.

The C-44 Project will become a component of this system, and incorporation of the Project into the decision tree and into the Adaptive Protocols process is recommended as part of the development of the POM. A technical committee should be formed to fully develop the operational rules for the Project and the integration with the WSE schedule. The success of the C-44 Project and its operational rules will be assessed by the CERP's Restoration Coordination & Verification (RECOVER) program.

5.6 Major Constraints

Potential constraints to the operation of the C-44 Project include the following:

- Available storage in the C-44 Reservoir and STA cells
- Optimum stage of the C-44 Canal between 14.0 and 14.5 feet NGVD (LOWCP, 2000)
- Minimum elevation of 12.56 NGVD in C-44 Canal for navigation (LOWCP, 2000)
- Minimum headwater elevation of 12 feet NGVD at S-80 (LOWCP, 2000)
- Maximum headwater elevation at S-80 of 15.5 feet NGVD (LOWCP, 2000)
- Optimum tailwater elevation at S-80 between 1.5 to 2.0 feet NGVD (LOWCP, 2000)
- Discharge at S-80 based on conditions in SLE (LOWCP, 2000)
- Stage of Lake Okeechobee and Regulatory Releases (per WSE schedule, LOWCP, 2000)
- Minimize drying out of the STA cells

The operational constraints are predominantly associated with the available Reservoir and STA storage, the hydration of the STA cells, and the operation of S-308 and S-80 by the USACE, as minimum and maximum stages and flows are specified in Lake Okeechobee, the C-44 Canal, and at S-80 in the LOWCP. In addition, as discussed above, ecological protection and saltwater management in the St. Lucie Estuary will likely play a role in determining the amount of water that can be discharged from the Project through the RECOVER program.

5.7 Standing Instructions to Project Operators

Once the operational testing and monitoring phase of the C-44 Project has been completed, the SFWMD will be responsible for the day to day operations. During normal conditions, the C-44 Project water control structures will be operated in accordance with the final approved POM. Structures S-308 and S-80 are operated by the USACE, so close coordination will be required.

5.8 Operation to Meet Project Purposes

5.8.1 Achieving Natural System Goals, Objectives, and Benefits

Currently, when Lake Okeechobee elevation is in Zone A, B, C, or D, regulatory releases are made through the S-80 structure, which flows to the estuaries downstream. These releases have resulted in declines in aquatic vegetation and oyster populations. A major assumption made in the IRL-S PIR was that other components of the recommended CERP would be implemented. Together, these components would significantly reduce Lake Okeechobee regulatory releases compared to existing conditions.

5.8.2 Overall Plan for Water Control: C-44 Project

Operating criteria for the Project are designed to enable the Project to meet the performance measures outlined in the IRL-South PIR as stated in Section 5.2. The goals include storage, flow attenuation, water quality improvement, and meeting some of the irrigation demand of the basin. To meet the project performance goals, approximately 66% or more of the C-44 Basin runoff will potentially be captured and treated prior to release back to the C-44 Canal. The operational criteria are designed to maximize the amount of water routed through the project system, while regulating the discharge back to the C-44 Canal through operational rules to provide flow attenuation to the estuary. A general operations flow diagram is shown in Figure 5.4.

In general, the C-44 Reservoir/STA facility will do the following:

- Pump water from the C-44 Canal into the Reservoir via the intake canal,
- Pump water from the C-23 diversion to the Reservoir (future condition),

- Store water in the Reservoir to attenuate fresh water flows to the SLE and as a secondary benefit to allow partial treatment of the water to reduce nutrient concentrations,
- Distribute water to the STA cells on an equal load per acre basis (via the discharge structure and distribution canals) where additional treatment occurs to reduce nutrient concentrations, and
- Discharge treated water back to the C-44 Canal (via the seepage collection/discharge canal and site discharge at Easement 3).

The planned C-23 diversion will consist of a canal that will route water from the C-23 Canal into the C-44 Diversion Canal where it will flow via the Reservoir seepage collection canal to the Reservoir main pump station intake. This diversion will be implemented at a later date and is not currently part of the Project to be constructed in 2007. Operational scenarios incorporating C-23 will be refined when this phase of the Project is implemented.

Operational Testing and Monitoring Phase (OTMP). Operational testing is the first opportunity to test whether the Reservoir embankments, seepage control measures, canals, pumps and structures, etc. are operating as designed. Also, the initial fill is a period when STA plant growth must be closely monitored and operations adjusted to create optimum conditions for STA development. The OTMP will also be a period when the Project is integrated with the other Basin components. The NFSL elevation in the Reservoir is 41 feet NAVD 88 (water depth of 15 feet). Once the initial inflow events from C-44 cause the Reservoir stage to reach approximately 31 feet NAVD 88 and all reservoir components appear to be functioning as designed, water will then be diverted to the STA cells through the Reservoir discharge structure.

It is likely that the STA cells will not be planted but will be allowed to naturally recruit. A Test Cell program undertaken as part of the overall C-44 Reservoir/STA Project and currently nearing its operational phase will provide data regarding the rate and type of plant growth to be expected in the STA cells and whether or not the cells should be planted. The STA cells will initially be inundated so that soils are saturated but the STA is not flooded to allow germination of the natural seed bank. Existing swales will be flooded. Once the plants begin to grow, water levels will then be gradually raised to the anticipated eventual average operating depth of 1.5 feet. The OTM period is anticipated to last approximately one year.

Normal Operations Phase. Lake Okeechobee releases depend on the Lake stage and on climatic conditions, as discussed above and as shown in the WSE schedule (Figure 5.2). Generally, releases can occur if the Lake is at or above Zone D EL 14.5 ft (NGVD). The magnitude of the release is determined by the WSE Zone in which the Lake stage falls, which is in turn controlled by climatic conditions as discussed in Section 5.5. Also, according to the SFWMD OCC Structure Books for S-308 (revised 02/09/2000), when the Lake elevation is less than 14.5 ft NGVD, the lock is open and the flow through the structure is not regulated, allowing water in the C-44 Canal to flow back into Lake Okeechobee.

When there are regulatory releases from Lake Okeechobee, the ability of the C-44 Project to provide flow attenuation will be reduced because the flow rate for these releases may be significantly greater than the intake pump capacity for the C-44 Project. As discussed, the magnitude of the release and the potential impact of the Project will depend upon the WSE Zone in which the Lake stage falls. During times when high flow regulatory releases are occurring, it is anticipated that the Project will operate primarily to treat water from the C-44 Canal originating from both regulatory releases and basin flow (during storm events). Water released from the Reservoir is treated in the STA cells and released to the C-44 Canal. In this case, water being treated is likely to be predominantly Lake Okeechobee regulatory release water.

The general operational activities that would occur under current and near future condition that include regulatory releases from Lake Okeechobee and utilizing the current WSE schedule are as follows:

Scenario	Activity	Constraint
Lake Stage in WSE Zone D or higher, regulatory release occurring	Pump water from C-44 Canal into Reservoir. Release water from Reservoir and STA cells at normal discharge rate of 600 cfs.	Pumping is halted when Reservoir reaches Normal Full Storage Level (NFSL).
Lake Stage in WSE Zone D or higher, no regulatory release occurring	Pump water from C-44 Canal into Reservoir if Canal is above minimum stage of 12.0 feet NGVD (10.6 feet NAVD 88). Releases from the STA cells occur at depths greater than 0.75 ft.	Pumping is halted when Reservoir reaches NSFL. Conditions at S-80 will dictate release rate from STA cells.
Lake Stage in WSE Zones D or lower , release from Lake occurring (likely pulse release during dry period)	Pump water into Reservoir if Canal is above minimum stage of 12.0 feet NGVD (10.6 feet NAVD 88). Releases from the STA cells are adjusted based on conditions at S-80 and/or the estuary.	Discharge from STA cells halted when Reservoir reaches EL 29 feet NAVD88, or STA cells reach minimum depth of 0.75 feet.
Lake Stage in WSE Zone D or lower , no regulatory release occurring	Pump water into Reservoir if Canal is above minimum stage of 12.0 feet NGVD (10.6 feet NAVD 88). Releases from the STA cells are adjusted based on conditions at S-80 and/or the estuary.	Available water to the Project will likely be limited during these dry periods. Discharge from STA cells halted when Reservoir reaches EL 29 feet NAVD88 or STA cells reach minimum depth of 0.75 feet.

Note: Elevation datum at the C-44 Project site is: NAVD88= NGVD29 - 1.39 feet

Based on the above operating conditions, the water level in the Reservoir will fluctuate depending on the availability of water. The first priority during dry periods will be to keep the STA cells hydrated. When the Reservoir decreases to a water

depth of 3 feet (EL 29 ft NAVD 88), discharge from the STA cells to the C-44 Canal will be discontinued unless the STA cells reach a normal operating depth of 0.75 feet or greater.

5.8.3 Flood Damage Reduction

Normal and Emergency Operations. Structural flood protection in the IRL South watershed includes the extensive canal systems. The C-44 Canal is the primary canal, with other secondary and tertiary canals maintained by the local Water Control District and landowners crisscrossing the landscape. The C-44 Project will not compromise the existing level of flood protection and it is not a specific goal of the Project to increase the level of flood protection.

Hurricane or Tropical Storm Operations. The hurricane season occurs each year from June 1 to November 30. When there are tropical depressions, tropical storms, and/or hurricanes in the Atlantic/Caribbean basin or the Gulf Coast of Florida, the National Hurricane Center (NHC) issues public advisories, forecasts advisories, forecast discussions, and strike probabilities.

Water management operations for the C-44 Project during tropical storms or hurricanes will follow SFWMD Emergency Preparedness Manual Suggested Hurricane Operation Procedures, April 2004. The USACE Jacksonville District Emergency Operations Standard Operating Procedures document (CESAJ SOP 500-1-1) should be consulted for emergency preparation and actions.

When a storm threatens, the District's mission of flood control protection becomes the number one priority. Throughout the year the District conducts an active maintenance program on its flood control system. In advance of a storm's arrival, the District may begin a gradual drawdown of its canals. This will provide additional storage capacity in the canal system for flood water. This emergency situation would impact Project operations, and would require development of storm emergency procedures for the Project. When a storm emergency exists within District boundaries, the District's emergency manager activates and oversees the District's Emergency Operations Center. In addition, staff personnel will be assigned to the various county emergency operation centers within the District's boundaries to represent the District and serve as liaison for requests for information and emergency assistance.

Overflow/Uncontrolled Reservoir Discharge. The Reservoir discharge structure has three 14-ft long ungated service spillway openings at elevation 41 ft NAVD 88. The service spillways are located on three faces of the tower structure. Thus, any flows into the Reservoir, either from the pump station or by precipitation events, that raise the Reservoir stage above 41 feet NAVD 88, will be discharged from the structure freely without the use of the tower gates. A discussion of the spillway hydraulic capacity is provided in Volume 3. There is also a 60-ft long spillway at the end of the distribution canal at the southeast corner of STA Cell 3 to handle uncontrolled discharge from the Reservoir discharge structure. This spillway delivers water to the STA seepage collection canal, which flows to the western outlet

canal, which has an overflow spillway to the C-44 Canal (see Figure 3.1 in Section 3).

5.8.4 Water Quality

Water quality improvement is a goal of the C-44 Project, and operations will be linked to a water quality monitoring program that will assess Project performance based on water quality. The water quality goals for the Project, as specified in the PIR, are to reduce average annual phosphorus load by 34,557 kg/yr and average annual nitrogen load by 93,689 kg/yr (both excluding reductions from land conversion and irrigation). To determine if these goals are being met, a monitoring program will be developed to asses how the Project is performing with respect to nutrient reduction. A Draft Project Level Monitoring and Management Plan is being developed with input from District staff. This plan will be further developed through the design and permitting phases of the Project, when operating permit requirements will be established.

5.8.5 Water Supply Operations

Of the 12,000 acres in the C-44 Reservoir/STA Project area, roughly 8,000 acres are within the TIWCD service area. The TIWCD service area includes over 12 miles of roads, 34.5 miles of canals, two major irrigation pump stations, and several secondary water control structures and have been in operation for more than 30 years. Given that the C-44 Project is an independent Project, irrigation or drainage services from TIWCD will not be required. However, the Project will require a portion of TIWCD's irrigation and drainage system to be removed from service, as well as its main irrigation pump station. In order to maintain service to the remaining acreage within TIWCD's service area, permanent modifications to their system will be necessary. Construction of the Temporary TIWCD Reconfiguration will begin in October 2006 and will be tested before the initial construction of the C-44 Project.

5.8.6 Recreation

Public access facilities will be designed and built as part of the C-44 Project following the District's Recreational and Public Use policy. A recreational plan to manage activities for the Project is anticipated to consist of passive recreation in the area of the STA cells.

5.8.7 Fish and Wildlife

The Project's Reservoir and STA cells will not be operated specifically to enhance fish and wildlife species or their habitat, other than through consistent hydration of the STA cells, which will provide wetland habitat to wildlife. Existing irrigation/drainage canals within the Reservoir footprint will provide refuge for fish during periods of low Reservoir water level.

The West Indian Manatee is listed as a federally endangered species and is one of the most endangered species in Florida. As a response to recent manatee mortality

trends associated with water control structures, this Project will install manatee protection systems at the Reservoir Pump Station. The intent will be to reduce the risk of injury and mortality of the manatee. No special operations will be required.

5.8.8 Navigation

The Okeechobee Waterway traverses the state from the Atlantic coast to Lake Okeechobee via the St. Lucie Canal (C-44 Canal) and to the Gulf of Mexico via the Caloosahatchee River (C-43 Canal). The C-44 Canal is also part of the Intercoastal Waterway, which connects the Atlantic Ocean to the Gulf of Mexico; therefore, the project operations must not adversely impact maximum or minimum navigational depths. The minimum C-44 Canal stage for the Okeechobee Waterway from Port Mayaca (S-308) to the St. Lucie Lock (S-80) is 12.56 feet NGVD, or 11.17 feet NAVD 88. Optimum stage in the C-44 Canal is between 14.0 and 14.5 feet NGVD (LOWCP, July 2000). To meet these criteria, the C-44 Project Reservoir Pump Station would not normally operate if the canal is less than 12.0 feet NGVD (10.6 NAVD 88). If the canal stage is 15.5 NGVD or greater, no discharge from the STA cells will be allowed unless S-80 is open and discharges are occurring to offset canal stage increases, and/or water is being pumped into the Reservoir at the same rate as it is being discharged.

5.9 Pre-Storm Operations

If a heavy rainfall is forecasted for the C-44 Basin, the Reservoir Pump Station would be placed on standby. If a storm occurs in the basin, and storage is available in the C-44 Reservoir, normal operating condition would be followed. Operation in anticipation of heavy rainfall from tropical storms or hurricanes is discussed in Section 5.8.3.

5.10 Consistency with the Identification of Water Reservations or Allocations for the Natural System

The Programmatic Regulations for the Comprehensive Everglades Restoration Plan require that the Project Operations Manual be consistent with the reservation or allocation of water for the natural system as described in the PIR and reflect the operational criteria used in the identification of the appropriate quantity, timing, and distribution of water dedicated and managed for the natural system. Currently, no reservations are anticipated for the C-44 Project. Operations at low Reservoir stage and during drought conditions will be optimized to facilitate hydration of the STA cells during these conditions.

5.11 Consistency with the Savings Clause and State Assurances Provisions

The Programmatic Regulations for the Comprehensive Everglades Restoration Plan require that the Project Operations Manual be consistent with the reservation or allocation of water for the savings clause provisions described in the PIR. The C-44 Project basically stores water for treatment and then delivers water back to the C-44

Canal. As such, it is not anticipated that the Project will eliminate or transfer water, or have an impact on the existing users of water.

5.12 Drought Contingency Plan

If a drought occurs in the C-44 Basin or project area, operations will be in accordance with the SFWMD Rules, Chapter 40E-21 F.A.C., Water Shortage Plan. The project will likely be classified under the Lake Okeechobee Region and the St. Lucie River Water Use Basin. In addition to the restrictions set forth by the plan, three feet of water is to be reserved in the Reservoir during dry periods to ration water to the STA cells. If this water is depleted, temporary pumps may be used to pump water back to the distribution canal using water from the STA seepage collection canal. Increased seepage from the STA cells may occur due to a drought-induced lower water table elevation. In this case, recirculation of STA water could offset decreasing water levels in the STA.

5.13 Emergency Action Plan

The Federal Emergency Management Agency (FEMA) and the Federal Energy Regulatory Commission (FERC) encourage a transition of dam safety programs into a detailed, comprehensive Dam Safety Performance Monitoring Program (DSPMP) that begins with project planning and design. Monitoring the performance of the Project to assure that possible dam failures are avoided or adequate warning time of potential or impending failures is an essential part of a dam safety program.

Dam safety for the C-44 Project began with the site characterization, continued with the BODR, and will carry through design, construction, and operations phases of the Project. One of the key aspects of the Dam Safety Performance Monitoring Plan is the Emergency Action Plan (EAP). The Emergency Action Plan is a formal document that identifies potential emergency conditions at the C-44 Reservoir/STA system and specifies preplanned actions to be followed to minimize property damage and loss of life. The EAP specifies actions that SFWMD will take to moderate or alleviate the problems at the Reservoir and the rules of local emergency management officials. It also contains procedures and information, including inundation maps, to assist SFWMD in issuing early warning and notification messages to responsible emergency management authorities of any emergency situations.

5.14 Deviations from Normal Operating Criteria

The Jacksonville District (SAJ) Engineer is occasionally requested to deviate from the normal regulation of Lake Okeechobee and the canals. Prior approval for a deviation is to be obtained from the SAJ except as noted below. SAJ will turn in the necessary approvals from the South Atlantic Division (SAD) office. Deviation requests usually fall into the categories discussed below.

5.14.1 Emergencies

Some examples of emergencies that may result in the need to deviate from normal operating criteria include drowning and other accidents, failure of the operations facilities, and chemical spills and other temporary pollution problems. Water control actions necessary to abate the problems will be implemented immediately unless such action would create an equal or worse condition. SAJ shall be informed as soon a practicable. A written confirmation of the deviation and conditions will be furnished to the SAD after the incident.

5.14.2 Unplanned Minor Deviations

There are unplanned instances that create a temporary need for minor deviations from the normal operating criteria, although they are not considered emergencies. Construction accounts for the major portion of these incidents requiring minor deviations. Deviations are sometimes necessary to carry out maintenance and inspection of facilities. Request for changes in pumping or release rates are generally a few hours to a few days. Each request is analyzed on its own merits. Consideration is given to watershed conditions, forecasted flood threat, the existing condition of the Reservoir storage area, and possible alternative measures. In the interest of maintaining good public relations, these deviations are generally granted provided that these deviations will not have an adverse affect on the ability of the Project to achieve its authorized purposes. Approval for these minor deviations normally will be obtained by SAD by telephone. Written confirmation explaining the deviation and its cause will be furnished to the SAD.

5.14.3 Planned Deviations

Each condition should be analyzed on its own merits. Sufficient data on flood forecasts, watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes, will be presented to the SAD for review and approval.

5.15 Rate of Release Change

Control structures should be opened and closed gradually. This provides an even transition to the new flow regime and minimizes hydraulic effects downstream. Special attention should be given to the maximum gate opening curve for each structure to ensure that the tailwater has a chance to build up before large scale openings are made.

5.16 Seepage Control

Seepage from the Reservoir and STA cells will be controlled on-site by seepage canals installed around the perimeter of the Reservoir and STA cells (Section 3, Figure 3.1). Should off-site seepage become a problem, the perimeter canal will be lowered to induce off-site flow toward the seepage canals.

5.17 Initial Reservoir/Storage Treatment Area Filling Plan

The initial filling plan is the first opportunity to test whether the Reservoir embankments, seepage control measures, canals, pumps and structures, etc. are operating as designed. Also, the initial fill is a period when STA plant growth must be closely monitored and operations adjusted to create optimum conditions for STA development. A detailed startup plan will be developed for the Project. The plan will include, but is not limited to the following:

- Preferred filling rate, available options to control the filling rate, as well as the consequences of sole purpose operation to control the rate, water quality requirements for initial filling, and the most probable types of problems that may develop during initial filling.
- Description of the proposed hydrologic data collection and transmission system and the plans for reading and evaluating instrument data and making visual inspections of the embankments and downstream areas, both related to increments of pool level.
- Instructions for observers on conditions that require immediate attention of personnel authorized to make emergency decisions. Description of the agency/organization that will be responsible for decisions and implementation of emergency plans as necessary. Provision of an emergency phone list to include name/position, telephone and pager numbers, and radio frequencies to be used.

5.18 Non-Typical Operations for Reservoir/ Storage Treatment Area Performance

Procedures for operations to avoid or minimize drying out of the STA cells during drought periods will include the following:

- First operational priority during droughts is for the STA cells to remain hydrated.
- Allow water to be discharged to the STA cells as long as water is available in the Reservoir.
- Once the Reservoir reaches a water depth of 3 feet (EL 29 ft NAVD), discontinue discharging from the STA cells unless the STA cells reach a depth of 0.75 feet or greater.
- Recirculate water from the STA seepage collection canal to the distribution canal if the Reservoir is unable to provide water.

5.19 Water Control Data Acquisition System Plan

Both Project pump stations and water control structures with gates will be equipped with remote automation components and operated by use of a remote telemetry

system. The automated components of all pump stations and structures that will eventually be operated and maintained by the SFWMD will conform to SFWMD standards. Equipment used in data acquisition essential to the water control management function will be included in the Water Control Data Acquisition System Plan (WCDASP), which will be developed during the design phases of the Project. This will include all hardware and software to be used for acquisition, transmission, processing, display, and dissemination of hydrologic, meteorological, water quality, and project data for the purposes of supporting the water control mission. This includes, but is not limited to, uninterruptible power supplies, field data collection platforms, and data communication devices and circuits. The WCDASP will also identify the site location of all hardware included in the plan. Hardware siting and gage reference datum will be determined through coordination with appropriate agencies including the U.S Geological Survey and SFWMD. The WCDASP will be completed during the plans and specifications phase and will be a subset of the Water Control Data System that is specific to the IRL-S Project.

5.20 Consistency with the Adaptive Management Program and Periodic CERP Updates

After long-term operations and maintenance of the Project has been initiated, the POM may be further modified based on operating criteria approved by the USACE and the SFWMD resulting from CERP updates and recommendations from the Adaptive Management process as outlined in CERP Guidance Memorandum #6, Assessment Activities for Adaptive Management. A Project-Level Monitoring and Management Plan will be developed as discussed in Volume 1 to support the adaptive management process.

5.21 References

Central and South Florida Project, Comprehensive Everglades Restoration Plan, Programmatic Regulations, Six Program-Wide Guidance Memorandum: Guidance Memorandum #5, Operating Manuals, South Florida Water Management District, U.S. Army Corps of Engineers, Jacksonville District, April 2005.

Goetz, Andrew. U.S. Army Corps of Engineers, Jacksonville District. February 2006. Lake Okeechobee Regulation Schedule Study. Public Workshop Presentation. Presentation available at http://www.saj.usace.army.mil/pao/hotTopics/hot_topics_LO_HHD.htm

SFWMD Operations Control Center (OCC) Structure Books for S308 and S80.

U.S. Army Corps of Engineers, Jacksonville District. July 2000. Central and Southern Florida Project, Water Control Plan for Lake Okeechobee and Everglades Agricultural Area.

U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District. March 2004. Central and Southern Florida Project, Indian River Lagoon-South, Final Integrated Project Implementation Report and Environmental Impact Statement.

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TABLES

TABLE 5.1
PROJECT COMPONENTS SUMMARY

	Estimated Quantity	Unit
Reservoir		
Wet Surface Area at Normal Full Storage Level (NFSL)	3,400	acres
NSFL	41	feet (NAVD 88)
Water Depth at NSFL	15	feet
Storage Volume at NFSL	50,930	acre-feet
Embankment Length at Centerline	48,697	linear feet
Embankment Crest Elevation	54.4	feet
Inlet Pump Station Capacity (maximum rate)	1,100	cfs
Reservoir/STA Discharge Structure (maximum rate)	1,100	cfs
STA cells		
Number of STA cells	7	
Total Wet Surface Area	6,300	acres
Total Number of Remotely Controlled Inlet Gate Structures	20	
Total Number of Weir Outlet Structures	40	
Total Number of Remotely Controlled Outlet Gate Structures	7	
STA Embankment Crest Width	14	feet
STA Embankment Crest Elevation	33	feet (NAVD 88)
STA Embankment Approximate Total Length	166,700	feet
Canals		
Intake Canal Approximate Length	20,600	linear feet
Intake Canal Bottom Width (varies)	30 to 60	feet
Intake Canal Bottom Elevation	3	feet (NAVD 88)
Intake Canal Operating Level (at C-44 Canal)	>10.6	feet (NAVD 88)
Reservoir Seepage Collection (RSC) Canal (North, West, South)	40,800	linear-feet
RSC Canal Bottom Width	10	feet
RSC Canal Bottom Elevation	12	feet (NAVD 88)
RSC Canal East	12,623	linear feet
RSC Canal East Bottom Width	5	feet
RSC Canal East Bottom Elevation	12	feet (NAVD 88)
STA Distribution Canal Bottom Width	10	feet
STA Distribution Canal Bottom Elevation	18.5	feet (NAVD 88)
STA Distribution Canal Normal Operating Level	28 to 29	feet (NAVD 88)
STA Seepage Collection/Discharge Canal Bottom Elevation	12	feet (NAVD 88)
STA Collection/Discharge Canal Easement No. 3 Control Structure (Gated Structure) Invert	16	feet (NAVD 88)
STA Collection/Discharge Canal Easement No. 3 Control Structure (Weir) Crest	19.5	feet (NAVD 88)

TABLE 5.2
SITE STRUCTURE SUMMARY

ITEM	TAG NO.	DESCRIPTION
1	S-482A	CELL1 INLET GATE NO. 1
2	S-482B	CELL1 INLET GATE NO. 2
3	S-482C	CELL1 INLET GATE NO. 3
4	S-486A	CELL1 WEIR OUTLET STRUCTURE NO. 1
5	S-486B	CELL1 WEIR OUTLET STRUCTURE NO. 2
6	S-486C	CELL1 WEIR OUTLET STRUCTURE NO. 3
7	S-486-D	CELL1 AUXILLARY DISCHARGE GATE NO. 1
7	S-487A	CELL2 INLET GATE NO. 1
8	S-487B	CELL2 INLET GATE NO. 2
9	S-487C	CELL2 INLET GATE NO. 3
10	S-488A	CELL2 WEIR OUTLET STRUCTURE GATE NO. 1
11	S-488B	CELL2 WEIR OUTLET STRUCTURE GATE NO. 2
12	S-488C	CELL2 WEIR OUTLET STRUCTURE GATE NO. 3
13	S-488D	CELL2 AUXILLARY DISCHARGE GATE NO. 1
14	S-489A	CELL3 INLET GATE NO. 1
15	S-489B	CELL3 INLET GATE NO. 2
16	S-490A	CELL3 WEIR OUTLET STRUCTURE NO. 1
17	S-490B	CELL3 WEIR OUTLET STRUCTURE NO. 2
18	S-490D	CELL3 AUXILLARY DISCHARGE GATE NO. 1
19	S-491A	CELL4 INLET GATE NO. 1
20	S-491B	CELL4 INLET GATE NO. 2
21	S-491C	CELL4 INLET GATE NO. 3
22	S-497A	CELL4 WEIR OUTLET STRUCTURE NO. 1
23	S-497B	CELL4 WEIR OUTLET STRUCTURE NO. 2
24	S-497C	CELL4 WEIR OUTLET STRUCTURE NO. 3
25	S-497D	CELL4 AUXILLARY DISCHARGE GATE NO. 1
26	S-471A	CELL5 INLET GATE NO. 1
27	S-471B	CELL5 INLET GATE NO. 2
28	S-471C	CELL5 INLET GATE NO. 3
29	S-498A	CELL5 WEIR OUTLET STRUCTURE NO. 1
30	S-498B	CELL5 WEIR OUTLET STRUCTURE NO. 2
31	S-498C	CELL5 WEIR OUTLET STRUCTURE NO. 3
32	S-498D	CELL5 AUXILLARY DISCHARGE GATE NO. 1

TABLE 5.2
SITE STRUCTURE SUMMARY
(CONTINUED)

ITEM	TAG NO.	DESCRIPTION
33	S-472A	CELL6 INLET GATE NO. 1
34	S-472B	CELL6 INLET GATE NO. 2
35	S-472C	CELL6 INLET GATE NO. 3
36	S-473A	CELL6 WEIR OUTLET STRUCTURE NO. 1
37	S-473B	CELL6 WEIR OUTLET STRUCTURE NO. 2
38	S-473C	CELL6 WEIR OUTLET STRUCTURE NO. 3
39	S-473D	CELL6 AUXILLARY DISCHARGE GATE NO. 1
39	S-474A	CELL7 INLET GATE NO. 1
40	S-474B	CELL7 INLET GATE NO. 2
41	S-474C	CELL7 INLET GATE NO. 3
42	S-475A	CELL7 WEIR OUTLET STRUCTURE NO. 1
43	S-475B	CELL7 WEIR OUTLET STRUCTURE NO. 2
44	S-475C	CELL7 WEIR OUTLET STRUCTURE NO. 3
45	S-475D	CELL7 AUXIALLARY DISCHARGE GATE NO. 1
46	S-401	MAIN RESERVOIR PUMP STATION
47	S-402	RESERVOIR DISCHARGE STRUCTURE
48	S-403A,B	RESERVOIR SEEPAGE CANAL DISCHARGE GATE AND SPILLWAY
49	S-404A,B	STA SYSTEM DISCHARGE GATE AND SPILLWAY (E3)
50	S-405	SPILLLWAY FROM DC TO SDC

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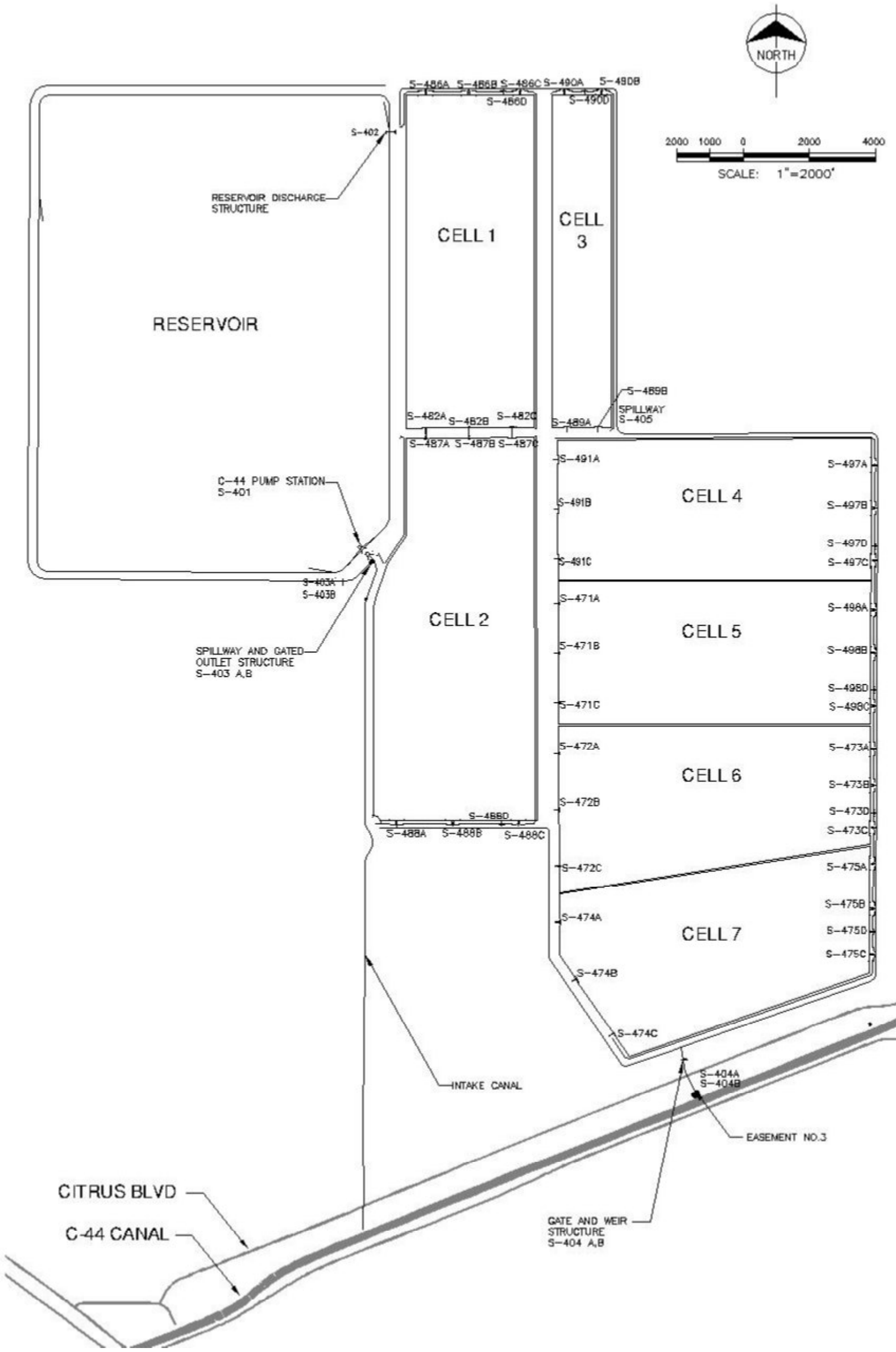
FIGURES



Source: structures.dxf

Figure File Name: Fig5.1 _Structures_DMD_070306.grf

Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

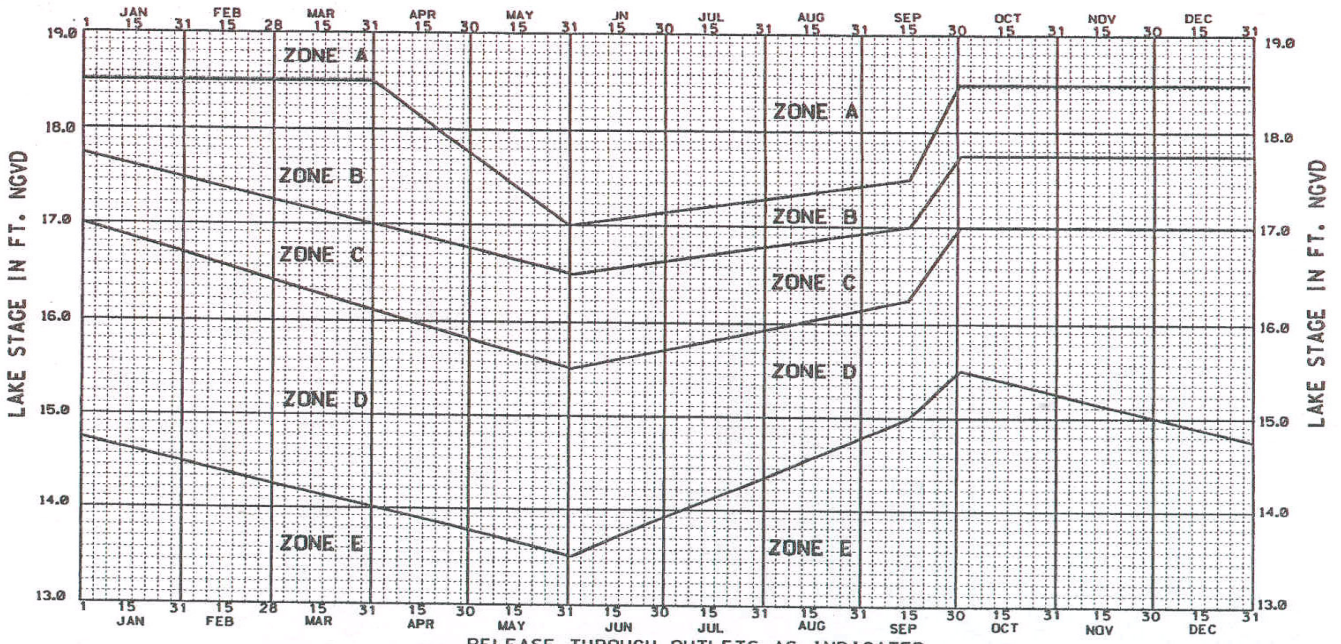
HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

Site Structures

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
5.1



ZONE	AGRICULTURAL CANALS To WCAs (1.2)	CALOOSAHATCHEE RIVER AT S-77 (1.2.4)	ST. LUCIE CANAL AT S-80 (1.2.4)
A	PUMP MAXIMUM PRACTICABLE	UP TO MAXIMUM CAPACITY	UP TO MAXIMUM CAPACITY
B (3)	MAXIMUM PRACTICABLE RELEASES	RELEASES PER DECISION TREE (THESE CAN RANGE FROM MAXIMUM PULSE RELEASE UP TO MAXIMUM CAPACITY)	RELEASES PER DECISION TREE (THESE CAN RANGE FROM MAXIMUM PULSE RELEASE UP TO MAXIMUM CAPACITY)
C (3)	MAXIMUM PRACTICABLE RELEASES	RELEASES PER DECISION TREE (THESE CAN RANGE FROM NO DISCHARGE UP TO 6500 CFS)	RELEASES PER DECISION TREE (THESE CAN RANGE FROM NO DISCHARGE UP TO 3500 CFS)
D (3.5)	AS NEEDED TO MINIMIZE ADVERSE IMPACTS TO THE LITTORAL ZONE WHILE NOT ADVERSELY IMPACTING THE EVERGLADES. (SEE NOTE 5.)	RELEASES PER DECISION TREE (THESE CAN RANGE FROM NO DISCHARGE UP TO 4500 CFS)	RELEASES PER DECISION TREE (THESE CAN RANGE FROM NO DISCHARGE UP TO 2500 CFS)
E	NO REGULATORY DISCHARGE	NO REGULATORY DISCHARGE	NO REGULATORY DISCHARGE

NOTES: (1) SUBJECT TO FIRST REMOVAL OF RUNOFF FROM DOWNSTREAM BASINS
(2) GUIDELINES FOR WET, DRY AND NORMAL CONDITIONS ARE BASED ON: 1) SELECTED CLIMATIC INDICES AND TROPICAL FORECASTS AND 2) PROJECTED INFLOW CONDITIONS. RELEASES ARE SUBJECT TO THE GUIDELINES IN THE WSE OPERATIONAL DECISION TREE, PARTS 1 AND 2.
(3) RELEASES THROUGH VARIOUS OUTLETS MAY BE MODIFIED TO MINIMIZE DAMAGES OR OBTAIN ADDITIONAL BENEFITS. CONSULTATION WITH EVERGLADES AND ESTUARINE BIOLOGISTS IS ENCOURAGED TO MINIMIZE ADVERSE EFFECTS TO DOWNSTREAM ECOSYSTEMS.
(4) PULSE RELEASES ARE MADE TO MINIMIZE ADVERSE IMPACTS TO THE ESTUARIES
(5) ONLY WHEN THE WCAs ARE BELOW THEIR RESPECTIVE SCHEDULES

CENTRAL AND SOUTHERN FLORIDA
INTERIM REGULATION SCHEDULE
LAKE OKEECHOBEE

DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA
DATED: 5 NOVEMBER 1999

WSE (WITH CLIMATE OUTLOOK)

Reference: Lake Okeechobee Water Control Plan, 2000

Figure File Name: Figure 5.1_dmd_062306.grf

Acceler8
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SUITE 250
TAMPA, FL 33607
CA 4213

WSE Zones for Lake Okeechobee

C-44 Reservoir/STA Project/
Preliminary Design Report
Contract # CN040918 WO 12

DATE
07/06/2006

FIGURE
5.2

6.0 DRAFT PROJECT LEVEL MONITORING AND MANAGEMENT PLAN

6.1 Introduction

The purpose of this section is to provide an update to the Draft Project Level Monitoring and Management Plan (Monitoring Plan) that will ultimately be utilized by District personnel for hydrometeorlogic and water quality monitoring of the C-44 Reservoir/STA Project (Project). The Basis of Design Report (BODR, April 14, 2006) presented a plan for Baseline monitoring and a procedure for developing a monitoring plan for the start-up and operations phase of the Project. This section of the Preliminary Design Report further advances the start-up and operations phase monitoring program based on workshops performed with District staff, including a description of Project components, monitoring of flow volumes through the Project to assess performance, proposed water quality monitoring to assess performance, and a draft plan to address the CERP requirements for mercury and other toxicants.

As discussed in the CERP Guidance Memorandum 040.00 (CGM 040.00, May 2004), further development of the Monitoring Plan will involve an iterative process that will continue throughout the life of the Project. The Draft Monitoring Plan will be updated at specific intervals during the design, construction, start-up, and operational phase of the Project. Refinements to the operating criteria in the Monitoring Plan will be made as more design details, data, operational experience and information is gained during these phases. It is also anticipated that once the Monitoring Plan is completed and the long term operations and maintenance phase is underway, it may be necessary to revise the Monitoring Plan based on additional scientific information gained from the new CERP or non-CERP projects or activities being implemented, new CERP program updates, etc.

Under CERP, system-wide monitoring is performed at a spatial scale that incorporates one or more ecological regions and is designed to track and measure cumulative responses and the overall performance of the CERP (CGM 040.00). The RECOVER (Restoration, Coordination and Verification) program is responsible for developing and implementing the system-wide monitoring program in CERP. The information or data generated from this effort are used to guide the adaptive management process. RECOVER has developed the CERP Monitoring and Assessment Plan (MAP) which establishes "the framework for measuring and understanding system responses to the CERP to determine how well the CERP is meeting its goals and objectives, and to identify opportunities for improving the performance of the CERP where needed." The MAP identifies regional environmental performance, (e.g. monitoring of the St Lucie Estuary will be utilized to evaluate the cumulative performance of the IRL-S PIR projects).

Project level monitoring will be performed to assess conditions at the project site. Project level monitoring will fulfill several major purposes.

- Characterize baseline conditions of the project area, drainage basin and receiving waters. Monitoring is typically conducted prior to construction to

establish baseline conditions in the environment affected by the Project or within its zone of influence to compare to post-project conditions.

- Assess environmental impacts or responses in the project zone of influence resulting from construction and operation of the project elements.
- Provides data needed to ensure that the Project is in compliance with its construction and operating permits.
- Assess long-term operational performance during post-construction start-up and regular operations and provides data to evaluate whether the Project is meeting or has met its objectives. It also supports water management decision making and the adaptive management processes and provides evidence or rational to support project activities and decisions concerning design or operating alternatives.

As the Project proceeds from the design phase to the construction phase, and finally to the operations phase, monitoring requirements will likely change. As updates and revisions are made to the Project Level Monitoring Plan (PLMP), individual revised pages will be clearly identified with the date of the latest revision. This Draft PLMP includes proposed monitoring elements for the operations phase of the Project. The process for developing this Draft PLMP included meetings with District staff that will continue as the Project design phase proceeds.

6.2 Project Goals and Objectives

The C-44 Reservoir/STA Project is a component of the program described in the Indian River Lagoon-South (IRL-S) Project Implementation Report (PIR) under CERP. The proposed reservoirs and stormwater treatment facilities in the IRL-South PIR are intended to regulate the timing of water delivered to the IRL and reduce nutrient inputs to sensitive receiving ecosystems such as the St. Lucie Estuary (SLE). Land conversions from agricultural uses to Reservoir/STA land uses are also expected to contribute to a net reduction in nutrient loads. Maintenance of desirable salinity levels is at the top of the list of proposed goals for the SLE (PIR p. 1-11). Improved overall water quality in the SLE and IRL follows as a close second priority.

The C-44 Project components were formulated to support specific performance measures of the IRL-S Project. The C-44 Project is expected to provide significant water quality treatment and flow attenuation benefits, but it alone will not accomplish all of the performance measures of the IRL-S PIR. The primary goals and objectives of the C-44 Project per the PIR are repeated here for convenience:

- Provide a minimum of 33,150 acre-feet of storage capacity (p.7-8),
- Attenuate peak C-44 Basin flows to the St. Lucie Estuary (pp. L-5, A-311)
- Reduce average annual phosphorus load by 34,557 kg/yr, excluding reductions from land conversion and irrigation(p. A-370)

- Reduce average annual nitrogen load by 107 metric tons (p. A-370)
- Provide level of service for irrigation demand of 2 in 10 years (p.6-77)

The Project goals are based on a future condition as specified in the IRL-S PIR, which includes a significant reduction of Lake Okeechobee regulatory releases and the inclusion of inflows from the C-23 Basin to the C-44 Project. The C-44 Project will operate initially with Lake Okeechobee regulatory releases at the current frequency until other CERP components are in place. In addition, since the C-44 Project will be the first of several IRL-S projects, the goal of the overall IRL-S program cannot be met until other components are in place.

The goal of the monitoring program is to assess whether or not the specific Project goals and objectives are being met. Designing a monitoring program that optimizes data collection and analysis to provide data of sufficient quality and quantity necessary to adequately evaluate the goals and constraints of the Project is the ultimate goal of the Monitoring Plan development process.

6.3 Active Mandates and Permits

The permits and/or agreements that will govern the sampling requirements of this Project will be developed through the permitting process. Permitting for the C-44 Project is projected to begin in early July 2006 with the submittal of the 404 and 1502 permit applications.

6.4 Purpose and Scope

This stage of the Draft PLMP development provides a working document that will ultimately be utilized to satisfy potential requirements of project permits and evaluate Project performance during start-up and operations. Baseline data is currently being performed to gather site information during the design and permitting phase of the project. SFWMD will ultimately maintain the long-term monitoring program for the C-44 Project during start up and operations to:

- Evaluate the Project performance relative to the nutrient removal and flow attenuation goals defined in the PIR.
- Evaluate compliance with permit conditions.
- Assess the condition and performance of Project components, such as structures, STA vegetation, and embankment performance.

6.4.1 Initiation Conditions

Baseline monitoring summarized in this document has been initiated per authorization by SFWMD. The specifics of subsequent monitoring for future phases of the Project are presented in preliminary form in this document and will be further developed with coordination between District and other necessary parties.

6.4.2 Modification or Termination Conditions

The monitoring program will be modified in response to construction, ecological, or other triggers. Simple modifications can be initiated as data indicates with approval from the appropriate agencies. Complex phased or tiered changes should be attached as separate plans and referenced. This monitoring program should not be terminated without written approval from the District and/or permitting agencies.

6.5 Baseline Monitoring Program Summary

The Baseline monitoring program is currently being performed by HDR to characterize baseline conditions of the project area, drainage basin and receiving waters. The Project Baseline Monitoring Plan was submitted to the District by HDR as part of Work Order 11, Task 3.11. Monitoring is typically conducted prior to construction to establish baseline conditions in the environment affected by the Project or within its zone of influence to compare to post-project conditions. The following hydrologic, meteorological and water quality data will be collected for the Project during Baseline Monitoring, which will be performed through June 2007:

- Groundwater levels in surfical aquifer
- Surface water levels in C-44 Canal
- Rainfall and Evaporation Data
- Quarterly Groundwater Samples at 11 monitoring wells
- Surface water samples at C-44 Canal and irrigation canal at the new pump station location

Baseline monitoring points are shown on Figure 6.1. During the baseline monitoring program period, monthly reports containing water level data, analytical results and laboratory reports will be submitted to SFWMD.

6.6 Project Level Monitoring for Start-Up and Operations

As the Project proceeds from the design phase to the construction phase, and finally to the operations phase, monitoring will focus on optimizing the monitoring program to the extent necessary to meet regulatory/permitting requirements, and to ensure that the Project operates as designed. The monitoring program will ultimately provide compliance with a future Florida Department of Environmental Protection (FDEP) 1502 permit and applicable State and Federal surface water quality criteria. Monitoring may also provide data that will advance the knowledge base of stormwater treatment area performance and optimization, especially in the sandy soils east of Lake Okeechobee.

The project-level monitoring plan development procedures for the C-44 Project during the Preliminary Design Phase included two workshops with District staff (monitoring plan development team (MPDT)) to define specific elements of the program. The monitoring plan development team provided input to the development of a monitoring plan for the Project. The input from the MPDT has been incorporated into this Draft PLMP.

Coordination with the District will continue until the design is complete and a Draft Final Project-Level Monitoring Plan is completed. The Draft plan will be submitted for review to the appropriate agencies and staff during various Project phases, and then will be prepared for implementation by SFWMD.

6.6.1 Project Components and Operations Overview

The C-44 Reservoir/STA project is comprised of one 3,400-acre, 15-ft deep reservoir and approximately 6,300 acres of STA divided into seven cells. The project components are shown on Figure 3.1 (in Section 3). The reservoir and STA are impoundments with earthen embankments. The STA cells are designed to maintain an average depth of 1.5 ft of water to support emergent vegetation. The STA cells are expected to help remove phosphorus, nitrogen, and other pollutants from the influent. The pump station will pump water at a maximum rate of 1,100 cfs from the C-44 Canal through an intake canal and into the reservoir. Water may also enter the intake canal through a gate and spillway from the reservoir seepage canal (C-44 C-2) that lies on three sides of the reservoir. A future connection to the C-23 Canal will deliver water to the reservoir seepage canal as well.

The Reservoir depth is maintained to a depth up to a Normal Full Storage Level of 15 ft (41 ft NAVD 88), based on climatic conditions and available storage. The floor of the reservoir will be at 26.0 ft NAVD 88 with a deeper sump area for the Reservoir discharge structure. Water is released through the reservoir discharge structure, a tower consisting of three 6 x 6 ft orifices at elevation 23.0 ft NAVD 88 and three 14-ft long service spillways with a crest elevation of 41.0 ft NAVD 88. Three sluice gates will be located inside the tower at the inlet orifices and two gates will be located at the outlet, thereby controlling the flow to two 7 x 7 ft box culverts. The inlet and outlet gates will be controlled by electric operators. The two box culverts discharge to the distribution canal.

Water will travel by gravity through the branches of the distribution canal and into the seven STA cells. The inlet structures are gated 5-ft diameter culverts and the outlet structures are fixed weir banks, consisting of two 20-ft long weirs and two 4 x 4 ft outlet culverts per bank. At water levels below the crest of the weirs, each STA cell may be drained completely through one 5-ft diameter gated culvert at the downstream end of each cell.

For normal operation with 600 cfs of steady-state flow from the reservoir discharge structure, approximately 90 cfs will flow through each of the STA cells 1, 4, 5, 6, and 7, approximately 120 cfs will flow through Cell 2, and approximately 40 cfs will flow through Cell 3. Overflow in the distribution canal is sent to the STA perimeter

seepage canal through a 60-ft wide spillway. The discharge from the STA cells is collected by the STA seepage collection/discharge canal and flows to the system gated discharge structure and/or 120-ft overflow spillway that connects the project to the C-44 Canal.

The proposed naming convention to be used for the C-44 Reservoir/STA elements is shown on Figure 6.2. Table 6.3 lists the names of the structures in each STA cell, along with their intended purpose. In general, the Project structure names will be based on structure numbers that the DISTRICT has designated for the Project in the Project Implementation Report (PIR) for the Indian River Lagoon and St Lucie Estuary. For example, the main pump station for the Project would be labeled as S-401, and the discharge structure as S-402. The canals on the Project site will be named by function, such as intake, distribution, seepage collection, but will include the name, "C44" to distinguish the Project canals from District canals. It was determined by the MPDT that the structure numbers should go in ascending order from North to South or East to West, depending on the orientation of the STA. The STA cell inlets will have the lower numbers, and the outlets, the higher. In conjunction with DISTRICT numbering, consecutive letters can be utilized to refer to structures that reside in the same stretch of levee.

6.6.2 Hydrologic and Meteorological Monitoring

Hydrologic and meteorological monitoring during operations will include collection of several data elements, (e.g. measurements of surface and groundwater levels, reservoir stage, canal gauging, and weather gauging). Monitoring of flow through the site structures will be a major component of the hydrologic monitoring program. The proposed hydrologic and meteorological monitoring elements for the startup and operations phases of the Project are discussed below.

Stage and Flow

Stage will be measured at various locations at the Project, including the C-44 Canal, Reservoir, intake canal, distribution canal, and at each STA inflow and outflow structure. Given the size of the C-44 Reservoir, multiple reservoir stage sensors will be required to monitor the effects of wind run-up and potential storm surge during major storm events. One stage sensor is proposed near each of the four corners of the Reservoir as shown on Figure 6.2.

Since the Project operations are dependant upon the stage in the C-44 Canal, a stage sensor will be placed in the C-44 Canal near the confluence with the intake canal as shown on Figure 6.2. Remote telemetry per SFWMD standards will be utilized to collect and transmit the data from the stage sensors.

A stage sensor will be located both upstream and downstream of each STA inflow and outflow structure, except for the STA cell drainage structures (low stage drainage). The SFWMD standard for stilling wells specifies the Balluff level sensor (BTL-5-E17-M3048-W-SU034-K05). The CERP Quality Assurance Systems Requirement (QASR) document for hydrometeorologic and hydraulic monitoring lists

other SFWMD-accepted water level sensors besides the Balluff linear position transducer. The other options include a Handar incremental encoder, Rittmeyer pressure transducer, and KPSI pressure transducer. A staff gage will be placed at each stilling well location to verify the level sensor readings. As stated by QASR, all vertical data, including water level data, will be collected in both the North American Vertical Datum of 1988 and the National Geodetic Vertical Datum of 1929.

The inflows and outflows through the Project are an important component of the monitoring program. Inflows to the Reservoir through the Reservoir Pump Station will be measured by using Acoustic Doppler Current Profilers (ADCPs) in the intake canal upstream of the pump station combined with stage measurements in the intake canal upstream of the pump station and downstream of the pump station (in-reservoir). Flow from the Reservoir to the STA discharge canal will be through the discharge structure as described in Section 6.6.1. Flow out of the discharge structure would be estimated for different gate configurations using Acoustic Doppler Current Profilers (ADCPs) in the discharge canal downstream of the discharge structure, along with stage measurements upstream (in-Reservoir) and downstream (in discharge canal) of the structure.

The STA will, at normal operations, run at a maximum of 600 cfs, which is a target for the Project, but will vary with Reservoir depth. The distribution canal, which delivers water from the Reservoir into the STA cells, uses several inlets per STA cell. Typically, flow is calculated per structure, with inlets having an increasing range of input flows in order to encourage flow downstream, and outlets having uniform outflow over the weir structure. The MPDT discussed potentially having flow instrumentation that can be used in culverts to help to develop a good flow rating when combined with open-channel ADCP measurements. Details of any additional flow instrumentation for structure flow measurement will be developed during the Intermediate Design Phase.

Groundwater Monitoring

Groundwater monitoring at the boundaries of the Project may be required to evaluate any seepage effects to the surficial aquifer at properties adjacent to the Project. The need for groundwater monitoring will be addressed with FDEP during the permitting process.

Weather

An automated weather station has been installed by SFWMD on the Allapattah complex at the location shown on Figure 6.1. The weather station will collect rainfall, atmospheric pressure, wind speed and direction, atmospheric temperature and moisture, evaporation, and solar radiation information. This information will be available through DBHYDRO.

6.6.3 Embankment Performance Monitoring

The embankment monitoring program for CERP is described in *"Design Guidance for Embankment Instrumentation and Monitoring"* (URS,2006). For the C-44 Project, there will be instrumented embankment sections spaced at intervals of approximately 5,000 ft. Each instrumented embankment section will include several piezometers to monitor the phreatic surface and assess performance of internal drains, measurements of flow from the internal drains, and one or more surface settlement monuments.

Given the number of geotechnical instruments installed at each embankment section, the guidance document requires that automated data acquisition systems, including remote telemetry, will be installed to collect and transmit the embankment monitoring data. Instrumentation located at the C-44 Project site will be read by a network of remote data acquisition units. The details of the embankment section instrumentation will be determined during the intermediate design phase of the Project.

6.6.4 Water Quality Monitoring

The following sections describe the preliminary plan for water quality monitoring activities as they are proposed for the different phases of the C-44 Project life span (start-up through operation). The monitoring requirements for Mercury and Other Toxicants as outlined in SFWMD's "*District Guidance in the Design of a Project-level Monitoring and Assessment Plan for Mercury, Pesticides and Other Toxicants*" draft version dated April 6, 2005, and CERP Guidance Memorandum 042, are presented in Attachment 1.

Operational Testing and Monitoring (Start Up)

The Initial Operational Testing and Monitoring Period (Start-Up) of the construction phase of the project consists of two activities: Pre-Discharge and Flow-Through (Discharge) Activities. Different criteria as determined by the permit must be met during these two phases of start up. Since the permit for the C-44 Project has not yet been issued, the specific criteria are not yet established; however, based on CERP guidance and permitting for similar projects, monitoring requirements can be anticipated and later refined as the design and permitting process proceeds.

Start-up monitoring will be performed to collect data to determine a reduction of total phosphorus (TP) loading and to verify that discharge from the STA does not cause or contribute to exceedances in Class III water quality standards. Water quality samples will be needed, at a minimum, at the Reservoir Pump Station, as well as out of the Reservoir to the distribution canal, and at a location that would be representative of what is being discharged out of the project to the C-44 canal. Anticipated parameters in addition to TP and frequency of collection for the start-up phase monitoring requirements are presented in Table 6.4, and will be confirmed through the permitting process. This initial stabilization period should be

approximately a year but could be longer depending on the initial performance of the STAs.

Monitoring of the startup phase of the STA is important to provide timely feedback for operational considerations such as inflow rates, residence time, and knowing when the STA is stable enough to begin making releases without causing or contributing to the degradation of water quality in the C-44 Canal. The STAs will not initially be vegetated, therefore, vegetation monitoring through aerial photographic techniques will likely be performed to track the progress of the STA vegetative recruitment during this phase.

To measure water quality coming into the Reservoir, water quality samples will be collected from a platform on the upstream side of the pump station at the intake canal (specific location to be determined, proposed location Figure 6.2). Samples will be collected via automatic sampler and grab samples. The pump station will be instrumented to trigger the automatic sampler when the pump(s) are running at speeds that will generate a sufficient flow (flow rates will be determined after the construction and exact specifications of the structure are known).

Water quality data at the outflow from the Reservoir to STA via the discharge canal will be collected from a platform on the discharge canal just downstream of the discharge structure (specific location to be determined, proposed location Figure 6.2). Samples will be collected via automatic sampler and grab samples. The structure will be instrumented to provide computed flow rates by using upstream and downstream stage. A remote terminal unit would totalize the discharge and trigger the automatic sampler. The automatic sampler will be programmed to collect samples on a time composite basis during the period of pre-discharge.

Water quality data at the Project outlet (to the C-44 Canal) will be obtained on the upstream side of the western outlet canal (S-404A, B) (specific location to be determined, proposed location Figure 6.2). Samples will be collected via automatic sampler and grab samples. The gated outfall structure will be instrumented to provide computed flow rates by using upstream and downstream stage. A remote terminal unit would totalize the discharge and trigger the automatic sampler. The automatic sampler will be programmed to collect samples on a time composite basis during the period of pre-discharge.

Optional grab samples may be obtained for each STA cell during start-up monitoring to assess the performance of the individual cells. Water quality data at each STA cell inlet will be obtained on the downstream side of the inlet structure. Water quality data at each STA cell outlet will be obtained on the upstream side of the outlet structure. The need for sampling individual STA cells will be determined during the Intermediate Design Phase.

Operational Phase Monitoring

The 1502 permit will specify water quality criteria that must be met by the Project during the Operational Testing and Monitoring Phase of the project. It is anticipated

that phosphorus, nitrogen, mercury, and pesticides will be included in the permit. When the C-44 Project meets the permit criteria during the pre-discharge activities, and during flow-through (discharge) activities, the facility will be ready for operational phase monitoring.

Monitoring during the operational phase will be used to track the compliance of the Project in meeting long term nutrient reduction goals, to assess the general performance of the Project and to ensure the Project is meeting all water quality standards and performance measures.

6.6.5 Parameter and Frequency Rationale

The parameter and frequency requirements for the C-44 Reservoir/STA Project are based on the most current accepted level of monitoring needed to determine STA performance and to track and assess any ecological changes to the system as a result of operations. The analytical parameters for the operations phase will be determined during the permitting process with FDEP. Anticipated parameters during the operations phase include: Total Phosphorus, Dissolved Oxygen, pH, Specific Conductance, Temperature, Nitrate + Nitrite, Total Nitrogen, Turbidity, Sulfate, Copper and Hardness

Total Phosphorus

Total Phosphorus must be monitored weekly to demonstrate a net reduction in concentration. This reduction occurs when the geometric mean of phosphorus concentrations collected at the outflow structures is less than the mean collected at the inflow structures. Total phosphorus will be collected via grab and automatic sampling methods as previously described.

Mercury, Pesticides and Other Toxicants

Refer to Attachment 1 of this document for details concerning mercury and other toxicants.

Expected Levels and Concern Triggers

Flow is the trigger for Automatic Sampler Composite Flow Proportional collections. Violations of Class III Water Quality Standards will be reported to FDEP. Dissolved Oxygen levels and Phosphorus levels for the Project discharge are anticipated to be established in the permit.

6.6.6 Data Quality Objectives

Data Uses, Resolutions, and Conclusions

The primary use of water quality data from the Project is to assess the phosphorus and nitrogen load reduction and quality of water delivered to Project outlet (S-404) after treatment in the STA cells.

Data Quality

Data quality refers to the level of uncertainty associated with a particular data point or value. This is assessed by examining the quality of collection and analysis, determining compliance to method and regulatory requirements, determining precision and accuracy of analysis, and any other background information affecting the data. Data not meeting the quality objectives must be qualified using standard FDEP qualifier codes (Ch 62-160, F.A.C.).

6.6.7 Review Process

Technical representatives of the monitoring staffs of SFWMD and federal and local sponsors will review the project level monitoring plan. RECOVER staff will review the plan for consistency with the system-wide monitoring plan in the RECOVER Monitoring and Assessment Plan (MAP) and other relevant RECOVER documents.

6.6.8 Approval Page

Prior to implementation of any aspect of the project-level monitoring plan, signature approval of the plan is required by the District Project Manager and representatives of the monitoring departments or divisions of the sponsoring agencies.

6.7 Access and Authority

The project can be accessed from two roads in the area. The C-44 Reservoir and STA can be accessed from Citrus Boulevard and Minute Maid Road. Monitoring sites within the project area will be accessed along the system of levees that surround the impoundments. Walkways and platforms will be constructed at various sites to gain access to autosamplers and to collect grab samples. Boat ramps will be installed at the STA cells so that each STA cell can be accessed by boat. Details for access to sampling sites will be determined once the sampling locations are finalized in subsequent iterations of the Project Level Monitoring Plan.

6.8 Quality Control

As required by the CERP Quality Assurance Systems Requirement (QASR) program, all CERP program participants must commit to the use of good Quality Assurance/Quality Control (QA/QC) management practices to produce data of verifiable quality and to maintain data integrity. These practices include adherence to requirements in Rule 62-160 FAC, Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOPs) for the collection of surface and groundwater samples, QASR, Monitoring Plans, CERP CGM 040, and other relevant documents. Only approved sampling and data collection procedures, as described in these documents, shall be used for CERP projects.

6.9 Summary

This document provides a preliminary version of the Monitoring Plan that will be implemented during the pre-construction phase for hydrometeorlogic and water quality monitoring for the C-44 Reservoir/STA Project. The plan will be further developed as the Project progresses through the design phase. The ultimate outcome of this process is a Project Level Monitoring Plan that can be implemented from construction through Project operations.

6.10 References

CERP Guidance Memorandum 040.00, April 25, 2004, Project Level Water Quality and Hydrometeorlogic Monitoring and Assessment.

CERP Guidance Memorandum 042.00, September 17, 2005, Toxic Substances Screening Process-Mercury and Pesticides

Draft CERP Monitoring and Assessment Plan, March 17, 2003.

Guidance for the Data Quality Objectives Process, September 1994, EPA QA/G-4, EPA/600/R-96/055.

Quality Assurance Systems Requirements (QASR) Manual for the Comprehensive Everglades Restoration Plan. U.S. Army Corps of Engineers and South Florida Water Management District. November 11, 2004. http://www. evergladesplan.org /pm/recover/qasr.cfm

TABLES

Table 6.1
C-44 Reservoir/STA Site Structures

Structure	STA Cell No.	Structure Type	Location	Purpose
S-482A	1	Gated Culvert	Upstream	Inflow
S-482B	1	Gated Culvert	Upstream	Inflow
S-482C	1	Gated Culvert	Upstream	Inflow
S-486A	1	Weir Bank	Downstream	Outflow
S-486B	1	Weir Bank	Downstream	Outflow
S-486C	1	Weir Bank	Downstream	Outflow
S-486D	1	Gated Culvert	Downstream	Cell Drainage
S-487A	2	Gated Culvert	Upstream	Inflow
S-487B	2	Gated Culvert	Upstream	Inflow
S-487C	2	Gated Culvert	Upstream	Inflow
S-488A	2	Weir Bank	Downstream	Outflow
S-488B	2	Weir Bank	Downstream	Outflow
S-488C	2	Weir Bank	Downstream	Outflow
S-488D	2	Gated Culvert	Downstream	Cell Drainage
S-489A	3	Gated Culvert	Upstream	Inflow
S-489B	3	Gated Culvert	Upstream	Inflow
S-490A	3	Weir Bank	Downstream	Outflow
S-490B	3	Weir Bank	Downstream	Outflow
S-490D	3	Gated Culvert	Downstream	Cell Drainage
S-491A	4	Gated Culvert	Upstream	Inflow
S-491B	4	Gated Culvert	Upstream	Inflow
S-491C	4	Gated Culvert	Upstream	Inflow
S-497A	4	Weir Bank	Downstream	Outflow
S-497B	4	Weir Bank	Downstream	Outflow
S-497C	4	Weir Bank	Downstream	Outflow
S-497D	4	Gated Culvert	Downstream	Cell Drainage
S-498A	5	Gated Culvert	Upstream	Inflow
S-498B	5	Gated Culvert	Upstream	Inflow
S-498C	5	Gated Culvert	Upstream	Inflow
S-471A	5	Weir Bank	Downstream	Outflow
S-471B	5	Weir Bank	Downstream	Outflow
S-471C	5	Weir Bank	Downstream	Outflow
S-471D	5	Gated Culvert	Downstream	Cell Drainage
S-472A	6	Gated Culvert	Upstream	Inflow
S-472B	6	Gated Culvert	Upstream	Inflow
S-472C	6	Gated Culvert	Upstream	Inflow
S-473A	6	Weir Bank	Downstream	Outflow
S-473B	6	Weir Bank	Downstream	Outflow
S-473C	6	Weir Bank	Downstream	Outflow
S-473D	6	Gated Culvert	Downstream	Cell Drainage
S-474A	7	Gated Culvert	Upstream	Inflow
S-474B	7	Gated Culvert	Upstream	Inflow
S-474C	7	Gated Culvert	Upstream	Inflow
S-475A	7	Weir Bank	Downstream	Outflow
S-475B	7	Weir Bank	Downstream	Outflow
S-475C	7	Weir Bank	Downstream	Outflow
S-475D	7	Gated Culvert	Downstream	Cell Drainage
S-401		Pump Station	SE Corner of Reservoir	Pump water to reservoir
S-402		Discharge Structure	NE Corner of Reservoir	Discharge water to STAs via Discharge Canal
S-403A,B		Gate and Spillway	Near Pump Station	Discharge from Reservoir Seepage Canal to Intake Canal
S-404A,B		Gate and Spillway	Easement 3	Discharge to C-44
S-405		Spillway		Divert water from Discharge Canal to STA Seepage Canal

Table 6.2
C-44 Reservoir/STA Project
Proposed WQ Parameters for Start Up

Parameter	Units	Sample Type	Sampling Frequency	Sampling Location
Alkalinity	mg/l	G	BI-W	Inflow and Outflow
DO	mg/l	insitu	BI	Inflow and Outflow
pH	SU	insitu	BI	Inflow and Outflow
Specific Conductance	umhos/cm	insitu	BI	Inflow and Outflow
Temperature	Deg C	insitu	BI	Inflow and Outflow
Total Phosphorus	mg/l	ACF / G	W / BI-W	Inflow and Outflow
Total Nitrogen	mg/l	G	BI-W	Inflow and Outflow
Turbidity	NTU	G	BI-W	Inflow and Outflow
Nitrate + Nitrite	mg/l	G	BI-W	Inflow and Outflow
Sulfate	mg/l	G	BI-W	Inflow and Outflow

FIGURES

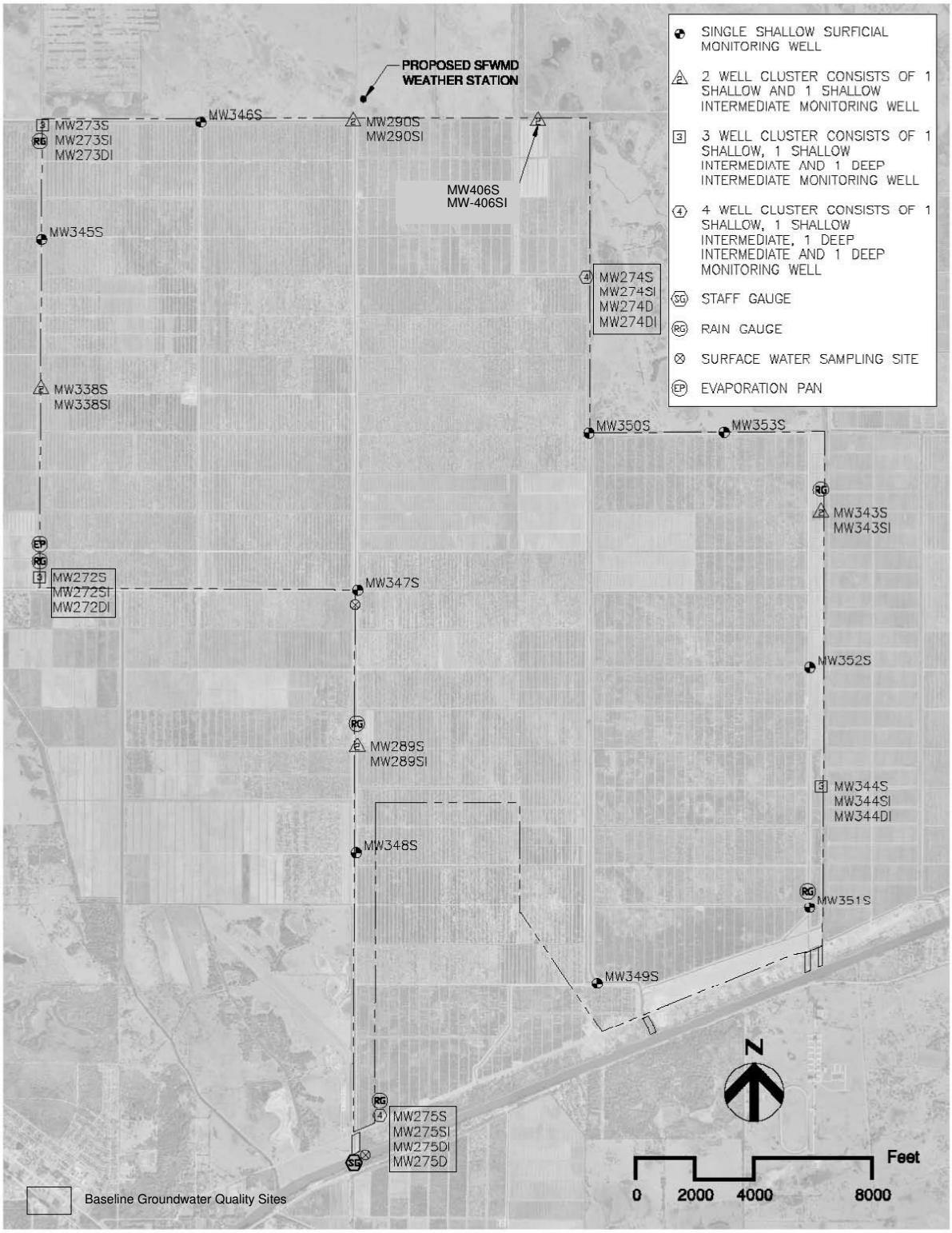

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Figure File Name: Figure 6.1_dmd_062706.grf

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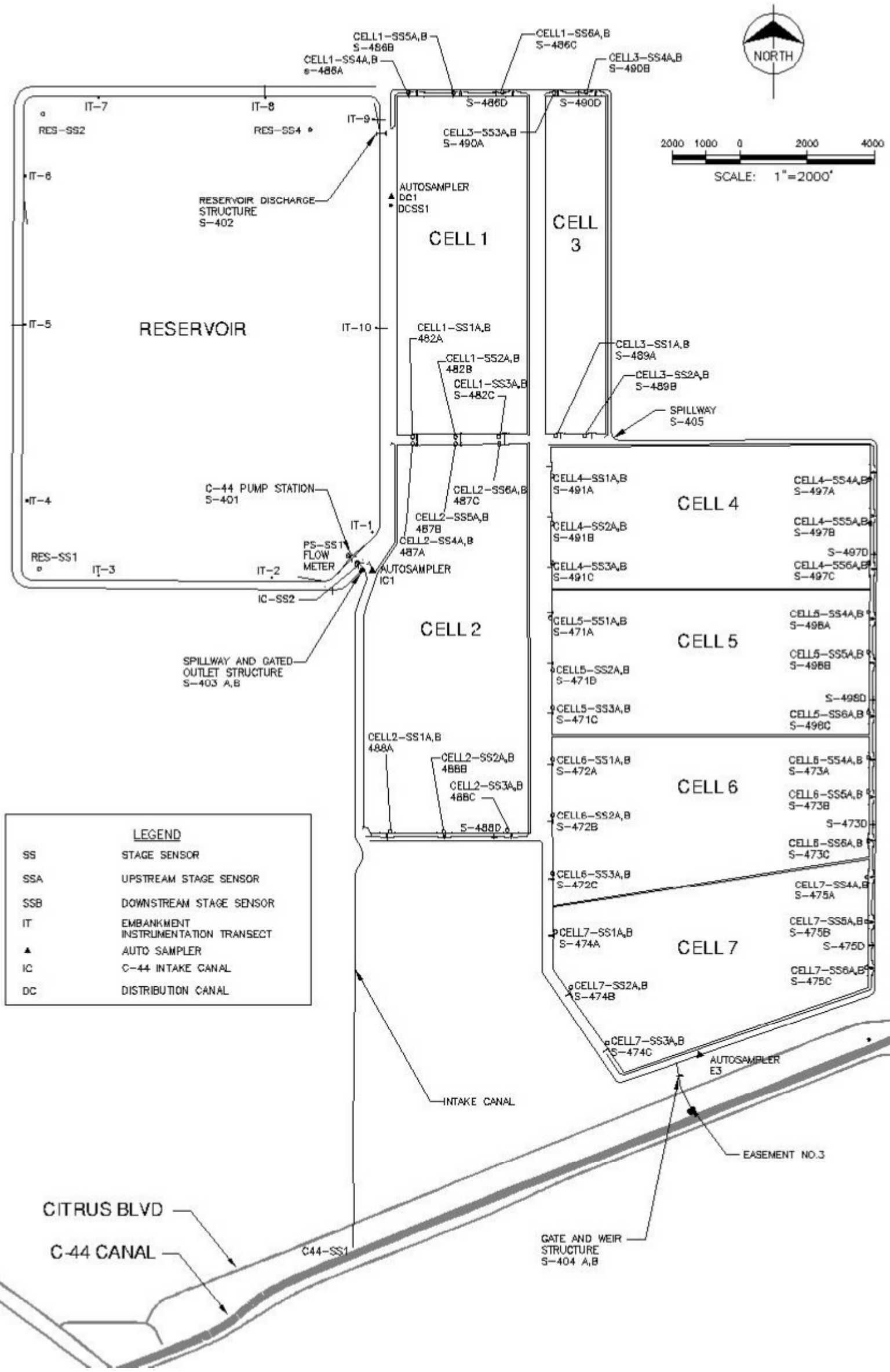
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

Location of Monitoring Points for Baseline Monitoring

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/07/2006

FIGURE
6.1



Source: structures.dxf

Figure File Name: Fig6.2 _Structures_dmd_062806.grf

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Site Structures and Instrumentation

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
6.2

ATTACHMENT 1
DRAFT MONITORING PLAN FOR MERCURY AND OTHER TOXICANTS

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ATTACHMENT 1
Draft Monitoring Plan for Mercury and Other Toxicants

1.0 Initial Start-up Monitoring Prior to Discharge

The C-44 Reservoir and STA project will be permitted under the Florida Department of Environmental Protection (FDEP) Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit. The District shall initiate start-up monitoring prior to discharge as follows:

1.1 Mosquitofish

When construction of the C-44 Reservoir and STA is complete, the District shall notify the Department and, within one month of filling or within one month following permit issuance, collect mosquitofish from multiple locations within each independently operated treatment cell of the STA to total at least 100 fish (*Collection sites to be determined*) and physically composite them into one (spatially-averaged) sample per independently operated treatment cell of the STA for THg analysis (note, a single aliquot should be analyzed per composite). Additionally, mosquitofish (to total at least 100 fish) will be collected from a single site located in the receiving water (C-44 Canal) downstream from the project and analyzed for THg (*Collection sites to be determined*). This downstream site is located in a canal with flow velocities that should allow for a resident population. The data for the downstream site will serve as a baseline for any future evaluations of potential impacts to the receiving waters.

The District shall provide the Department with the results of the first collection of mosquitofish as well as the appropriate action levels for comparison (90% upper confidence level of the basin-wide average or the 75th percentile concentration for the period of record for all basins). If tissue-concentrations from each independently operated treatment cell of the STA are below the 90% upper confidence level of the basin-wide average or below the 75th percentile concentration for the period of record for all basins (if basin-specific data are lacking), and after concurrence from the Department, the District may then initiate flow-through operation and routine monitoring for the STA cells (for details on routine monitoring, see below).

However, if Hg concentration in any of the mosquitofish composites from within the STA exceeds one of the above referenced action levels, the District shall, within 14 days of receiving quality assured data from the laboratory, collect a sample(s) to confirm the exceedance(s). In addition, the District shall consult with the Department to determine the most appropriate course of action and obtain authorization to initiate flow-through operation. At a minimum, the course of action will include implementation of Tier 2 Expanded Monitoring and Risk Assessment by the District during initial flow-through operations (e.g. collection of monthly mosquitofish within the STA and at one station downstream of the STA at a minimum), additional details on expanded monitoring are provided below and in CGM 042.00 and subsequent revisions (hereafter referred to in this document as the “CGM”). The recommended

course of action may also include additional measures as determined to be appropriate. When results of expanded monitoring demonstrate concentrations in each STA cell has decreased to acceptable levels (below action levels referenced above) and the concentrations at the downstream site are not significantly elevated above baseline levels, the District shall notify the Department and request that the monitoring revert back to Tier 1 routine monitoring.

1.2 Sediment

Prior to discharge, sediment cores will be collected from five representative locations within each STA cell. In addition, sediment cores will be collected at one downstream site in the receiving water (C-44 Canal). Efforts will be made to co-locate sediment sites with mosquitofish collection sites.

At each location or site, a minimum of three cores (number of cores in excess of three will be determined by amount of sediment required for analysis) from the 0-to-4 cm horizon are to be collected and composited as a single sediment sample.

To serve as baseline for future comparison, if future conditions warrant follow-up sampling of sediments (i.e., if Tier 2 were triggered), sediment samples will be analyzed for THg, MeHg, moisture content, total organic carbon (TOC), total sulfur (TS), and total iron (TFe). To allow for possible future analysis, remaining material from each sediment sample will be archived separately for the maximum hold time allowable for the specified parameter list.

1.3 Selection of Toxicants Other Than Mercury

The Phase I and II Environmental Site Assessment will be reviewed for data regarding this project. Based on this review, the need for monitoring toxicants other than mercury species will be determined with input from District staff.

The District shall provide the Department with the results of these analyses as well as the appropriate action levels for comparison. If the following criteria are met for a given flow way or cell, the District may initiate flow-through operation and routine monitoring for that flow way or cell (for details on routine monitoring, see below).

- If ambient mosquitofish do not demonstrate excessive bioaccumulation that exceeds a critical tissue benchmark used to establish SQAGs or in site-specific risk assessments;
- If concentrations in sediments do not exceed an effects-based, numerical sediment quality assessment guideline (SQAGs for sediment dwelling organisms, MacDonald Environmental Sciences Ltd. and USGS, 2003);
- If concentrations in sediments do not exceed an established bio-accumulative based SQAG, if available (MacDonald Environmental Sciences Ltd. and USGS, 2003), a action level reported in the ESA or a level that was determined to be critical in a site-specific risk assessment;

- If water-column concentrations do not exceeded a WQS in Chapter 62-302, F.A.C.

However, if one of the above referenced action levels is exceeded, the District shall, within 14 days of receiving quality assured data from the laboratory, collect a sample(s) to confirm the exceedance(s). In addition, the District shall consult with the Department to determine the most appropriate course of action and obtain authorization to initiate flow-through operation from that cell or flow way. At a minimum, the course of action will include implementation of Tier 2 Expanded Monitoring and Risk Assessment by the District during initial flow-through operations. The recommended course of action may also include additional measures as determined to be appropriate. When results of expanded monitoring demonstrate concentrations in each flow way has decreased to acceptable levels (below action levels referenced above), and the concentrations at the downstream site are not significantly elevated above baseline levels, the District shall notify the Department and request that the monitoring revert back to Tier 1 routine monitoring.

2.0 Monitoring During Stabilization Period

The District shall initiate monitoring after initial discharge and during the stabilization period as follows:

2.1 Tier 1: Routine Monitoring During Stabilization Period

2.1.1 Water

On a quarterly basis, an unfiltered surface water sample (n = 1) shall be collected in accordance with Chapter 62-160, F.A.C., at the inflow to the Reservoir, and the outflow from the Reservoir, and immediately upstream of the Project outflow from the STA cells (*Specific sampling locations to be determined*) from the project. These samples will be analyzed for THg, MeHg, and sulfate (the latter not to be duplicative if listed as a parameter under routine monitoring described elsewhere in the general monitoring plan).

Based on the discussion above regarding toxicants other than mercury, a surface water sample will be collected quarterly at the inflows and immediately upstream of the outflows and analyzed for the parameters deemed necessary *(to be determined*).

In addition, flow will be monitored at the inflow and outflow to allow for load estimation to and from the project (it should be recognized that quarterly sampling would allow for only rough estimation of loads).

This data set will be assessed to determine if outflow concentrations exceed WQS, and whether annual outflow loads of analyses are significantly greater than inflow loads, including atmospheric loading; load estimates will include confidence intervals that describe uncertainty in measures of flow and concentration (e.g., field and analytical precision) and resulting from interpolation (note: assessment protocol to

be negotiated with permitting authority). Failure to satisfy these assessment measures would trigger Tier 2 Expanded Monitoring and Risk Assessment (see below).

Because of differences in the anticipated time frames under which sedimentary release are thought to occur (i.e., relative to MeHg that may have time lag associated with changes in biogeochemistry and microbial methylation driven by water quality, especially in sandy soils), monitoring for other toxicants would cease after one year if action levels are not exceeded within that time.

2.1.2 Fish Tissues

Samples of fish from multiple trophic levels will be collected from each STA cell and from a single downstream site in the receiving water of the project (*Specific sampling locations to be determined*). Specifically, mosquitofish collections will be made in a similar fashion and continue on a quarterly basis from all sites that were sampled prior to discharge (see above; for rationale for the selection of this and other species listed below, see the CGM). On an annual basis, bluegill (n should be greater than or equal to 5) should be collected and individually analyzed as whole-fish. For the reasons discussed in the CGM, collections should target bluegill ranging in size from 102 to 178 mm (i.e., 4 to 7 inches); however, other lepomids (first priority being given to spotted sunfish) or sizes are to be collected if efforts fail to locate targeted fish. These samples will be analyzed for THg and other toxicants listed in Table 1 under tissues.

Assessment

To detect and minimize any adverse effects as early as possible (and to provide a basis for identifying adaptive management options, if deemed necessary), the results of this monitoring will be assessed based on the criteria and time table described under Phase 2- Tier 1 in the CGM. Monitoring results will be provided to the Department in accordance with the reporting requirements identified in Section 4.

2.2 Tier 2: Expanded Monitoring and Risk Assessment During Stabilization Period

In accordance with the CGM, if Tier 1 data exceed the action levels identified under Phase 2 – Tier 2 Expanded Monitoring and Risk Assessment, the District shall notify the Department and after obtaining the Department's concurrence, shall expand monitoring and undertake all necessary steps consistent with the CGM.

3.0 Operational Monitoring Following the Stabilization Period

The monitoring plan and associated data will be re-evaluated on a regular basis beginning after year-1 for other toxicants and after year-3 for mercury species to determine if criteria specified in the CGM are being satisfied. Based on that assessment, and with the concurrency of the Department, monitoring and assessment efforts may be reduced (as identified in Phase 3-Tier 1 Operational

monitoring of the CGM) or eliminated all together at the project level to be subsumed by regional monitoring (as identified in Phase 3-Tier 3 Operational monitoring). However, if monitoring reveals anomalous conditions as described under Phase 3-Tier 2, the District shall expand monitoring and undertake all necessary steps under Phase 3 – Tier 2 Expanded Monitoring and Risk Assessment.

4.0 Reporting Requirements

The permittee shall notify the Department immediately if monitoring data indicate that any of the action levels are exceeded. In addition, the permittee shall submit to the Department, as part of the annual South Florida Environmental Report, the results of the monitoring as defined above, including the following:

- Comparison of inflow and discharge concentrations with state water quality criteria;
- Comparison of inflow and outflow loads and concentrations for total mercury, methylmercury, and other toxicants; and
- Comparison of data with appropriate action levels.

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7.0 SUPPLEMENTAL SURVEY PACKAGE

A summary of the C-44 Project aerial and ground survey work program, developed in support of the preliminary design efforts, is presented in this section.

Temporary TIWCD Facility Reconfiguration

A Specific Purpose Survey was performed for the Temporary Reconfiguration of Troup Indiantown Water Control District (TIWCD) facilities. It encompassed:

- Ground and bathymetric surveys, providing for cross sections along Canal D and Running W Drainage Ditch within the site.
- Detailed survey of drainage/irrigation structures that will be affected by the project, including dimensions and descriptions of material of construction, upstream and downstream cross sections and invert elevations, and topographic data, spot elevations and breakline data of surrounding area (approximately 30 ft surrounding each structure).
- Verification of the east alignment of the Canal D Easement from Citrus Boulevard south to the Allapattah No. 1 spillway at C-44 Canal. Established distance between the east easement line and the canal toe of slope along this north-south path. This data was needed to evaluate the ability of equipment and vehicles to maneuver in the vicinity of the Allapattah No. 1 spillway site.

Main Project

Fifteen (15) horizontal and vertical aerial targets were established; thirteen (13) of these are for Star Farms/Minton property and two (2) for Easement No. 1 and 2 (combined) and for Easement No. 5. The targeted project areas were surveyed using aircraft. The work involved developing one set of (9”x9”) stereoscopic black and white photographs, utilizing aerial triangulation of mapping photography and aerial triangulation of raster imagery, as well as, stereoscopically compiling the photo identifiable planimetric features. Digital Terrain Model (DTM) vertical data for one foot contours were also compiled, as were spot elevations in unobscured areas to describe the project’s terrain. Ortho-corrected raster imagery was provided.

Additional surveying was undertaken to establish elevations within an existing tree-lined citrus grove operations area at four (4) cross-section locations, each approximately 1,000 feet in length in STA cell 4. The ground survey data was used to determine the level of accuracy of the aerial topographic survey data for this area of the project site. The data included:

- Grade elevations at center of grove beds, top of banks, and bottom of swales
- Drainage swale widths
- Breaks in grade along cross-sections

To complement the survey just described, elevations within a cleared citrus grove area at the C-44 Test Cell area were obtained at three (3) locations. This data was used to verify/correlate previously provided aerial topography. The combined data sets were used to evaluate the effects of land clearing on the accuracy of the aerial topographic data.

The following additional survey efforts are underway:

- Cross-section information was obtained along Citrus Boulevard and the existing property within Easement Nos.1, 3, and 5. At Easement No. 1, the work established a correlation between ground-surveyed elevations and the latest topographic information provided by the aerial surveyor, as well as supplying data that will further the design of a drainage structure under Citrus Boulevard. At Easement No. 3, the work involved ground elevation verification due to heavy tree canopy in the area (precluding the aerial survey from providing accurate information). At Easement No. 5, the work established the necessary data to design a new bridge structure that will span the newly constructed Intake Canal. Services included:
    - Seven (7) -100 foot wide cross-sections spaced every 50 feet along the length of Citrus Boulevard at Easement 1 and 3. At Easement No. 3, additional topographic data extending 50 feet both north and south from the existing edge of pavement for Citrus Boulevard.
    - Eleven (11) - 100 foot wide cross-sections spaced every 50 feet along the length of Citrus Boulevard at Easement No. 5.
    - Existing drainage structure internal diameters and invert elevations at the Citrus Boulevard cross-sections.
    - Grade elevations along the width of each Easement including canal cross-sections.
    - Cross-sections of the entire width of Easement Nos.1 and 5 at 200 foot intervals starting at Citrus Boulevard and continuing south to the C-44 Canal.
    - Bathymetric information at five (5) cross-sections of the C-44 Canal from the north bank to centerline of the Canal spanning the width of Easement Nos. 1 and 5.
    - Cross-sections of the entire width of Easement No. 3 at 100 foot intervals starting at Citrus Boulevard and continuing south to the C-44 Canal.
    - Topographic data at the “Mid” Spillway (intersection with the C-44 canal) within Easement No. 3.

- FPL Powerline evaluation and other data are being obtained in order to evaluate clearances in support of the design wherever Project facilities cross the FPL easement. This will include the following three areas:

1. Where the FPL easement crosses the intake canal (Figure 3.1)
2. Where the FPL easement crosses the interior drainage canal between STA Cell 1 and STA Cell 3 (Figure 3.1).
3. Where the FPL easement crosses the seepage collection/discharge canal west of STA Cell 6 (Figure 3.1).

The work will include:

- Location of poles and any guy wires
- Elevation of lowest point along powerline between poles

- Elevation of all (35) site monitoring wells located on the C-44 Project site. The work provided vertical data at the top of riser within the casing of each monitor well.
- Vertical data for all (65) C-44 Project supplemental site explorations that were developed during the course of the project design effort.
- At the two parallel canals D-2/Tesoro, cross-sectional data and drainage structure information at eleven (11) locations along the two canals, eight of which will be along the portion of the canals that traverse the project site in the north-south direction down to Easement 3. The cross-section locations were established at an equal spacing of 2000 feet. Additional data captured by the survey work included drainage structures that intersect the canals at southeast corner of the Star Farms/Minton property and at the southwest corner of Bar-B Ranch property.

The survey work described above is summarized in Table 7.1. The surveying work products are being submitted to the District separately.

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TABLES

Table 7.1
C-44 Reservoir/STA Project
Summary of Supplemental Surveying
Preliminary Design Phase

Project Area	Survey Description	Deliverable
TIWCD Reconfiguration	Bathymetry, canal alignment, structure detail	Specific Purpose Survey
Main Project	Aerial photography, digital mapping	Photographs, digital map files, survey and map report
	Citrus Grove Area Cross-section elevations	Specific Purpose Survey
	Roadway, easement cross-section elevations, structural detail, bathymetry	Specific Purpose Survey
	Vertical data-site wells and borings	Specific Purpose Survey
	Canal cross-sections, structure detail	Specific Purpose Survey

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8.0 SITE CHARACTERIZATION

8.1 Introduction

The purpose of this geotechnical and geological site characterization update is to present data obtained during the Preliminary Design phase of the Project. A "*Final Geotechnical and Geologic Site Characterization Report*" was submitted to the District on March 17, 2006, and includes all exploration and testing data obtained during the Basis of Design (BODR phase of the project). Since the BODR was submitted the Project site has undergone boundary changes due to the addition of lands northeast of the project, known as Minton and Star Farms properties, totaling 940 acres, and the future agreement to sell an "exchange parcel," totaling 1,100 to 1,200 acres, to the current grove operator, Consolidated Citrus L.P. for continued citrus production. The change in lands required modification of the Project configuration in a way that would optimize land use and still meet the Project objectives. The modified Project configuration that will be the basis of the Preliminary Design is shown in Section 3 on Figure 3.1. The major modifications to the site layout that affect the site characterization are the reshaping of the Reservoir to a more rectangular configuration and the deletion of one STA cell while enlarging two other cells.

The focus of this update is to confirm conditions in the newly acquired areas of the site, and to obtain geotechnical data at Project structure locations. The materials used for the construction of the C-44 Reservoir will likely originate from the areas of required excavation such as the canals and STAs, and the Reservoir and STA interior. These areas were investigated in the Minton and Star farms area to determine the geotechnical characteristics of the shallow subsurface materials so that the adequacy of these materials for embankment construction, and the suitability of the materials to support the Reservoir and STA embankments, could be evaluated.

The site characterization provides the basis for the Preliminary Design engineering analyses including embankment design, canal design, seepage analyses, and structure foundation design.

8.2 Preliminary Design Explorations

A field exploration program was developed and performed to supplement and verify the previous investigations performed at the Project site. The field exploration program was performed between April and June 2006. Field activities were coordinated and observed by HDR's field engineer, with support from geologists and engineers from Williams Earth Sciences, Inc. (WES) or Ardaman and Associates (Ardaman). The field exploration activities performed during the Preliminary Design phase included rotary wash borings (CB) in the following areas:

- Minton and Star Farms properties

- Along the eastern and northern alignment of the new Reservoir embankment centerline
- Reservoir Pump Station
- Citrus Boulevard bridge at the Intake Canal
- Reservoir discharge structure
- Distribution canal overflow spillway
- Easement 1 spillway
- Easement 3 gate and spillway to C-44 Canal

Rotary auger borings were also performed to obtain grab samples in the new Minton and Star Farms area. The following soil sampling methods were used in conjunction with the exploratory borings:

Boring Type	Sampling Method
Rotary Wash Borings (CB)	Standard Penetration Test (SPT)
Rotary-Auger (AB) and Test Pits (TP)	Disturbed grab sampling

The explorations were numbered sequentially picking up from the numbering scheme used in the BODR phase, in the order they took place. The explorations were located in the field using a Trimble© GPS receiver and ArcPad software distributed by ESRI. The locations of all field explorations are depicted on Figure 8.1, and the borings performed at the pump station are depicted in Figure 8.2. A summary of quantities of explorations performed as part of the Preliminary Design are included in Table 8.1

8.2.1 Rotary Wash Borings with SPT

The rotary-wash soil borings (CBs) with SPT were used primarily to evaluate the soil material beneath the proposed reservoir embankment and throughout the Project site. The boring program consisted of a total of 51 CBs ranging in depth from 30 ft to 110 ft, with the 30 ft borings located in the interior of the site, 50 and 75 ft borings near the reservoir embankment, and 75 and 110 ft borings at structure locations.

The borings were drilled using truck-mounted Central Mine Equipment (CME) 45 or CME 55 drill rigs. All drill rigs were equipped with a 140-pound automatic SPT hammer. The borings were advanced to depth using mud-rotary drilling to form a 3-inch-diameter borehole. Split barrel samples with SPT were collected continuously from the ground surface to a depth of 15 ft and at 5 ft intervals thereafter until the final depth of the boring. The SPT procedure conformed to the methods described in American Society for Testing and Materials (ASTM) D 1568.

The soil samples from the CBs were logged in the field by a field technician and then the soil samples were examined by a geologist in the laboratory in order to verify and refine the field classifications. Soil classification was performed in general accordance with ASTM D 2487-93, "Classification of Soils for Engineering Purposes, (Unified Soil Classification System" (USCS)). Copies of the boring logs are included in Appendix B – Site Characterization Data. The CB explorations are listed with state plane coordinates in Table 8.2.

8.2.2 Auger Borings

Rotary-auger borings (ABs) were performed at selected locations throughout the site to a depth of approximately 15 ft bls to obtain bulk soil samples.

ABs were advanced to depth using 4 inch diameter continuous flight helical solid stem augers by rotating the auger into the ground at a relatively uniform rate of penetration at 3 foot intervals. Samples were recovered from the boring by withdrawing the auger out of the ground without rotating it. This testing procedure closely conforms to the methods recommended in ASTM D 1452. A total of 8 auger borings were performed as summarized in Table 8.3.

8.3 Site Geologic and Hydrologic Conditions Update

A detailed description of the site geology and hydrogeology is included in the *Final Geotechnical and Geologic Site Characterization Report*" (HDR, 2005). The upper 100 to 150 feet of sediment is most relevant to the design of the Project. These sediments range in age from Holocene-Pleistocene to Pliocene, or from present to about 4.2 million years. Holocene soils and undifferentiated Pleistocene sands and clayey sands occur at the top of the section, and are underlain by quartz sand, shell, and a few minor limestones within the late Pleistocene Fort Thompson Formation. Marls, shell and sand deposits within the Caloosahatchee Formation underlie the Fort Thompson. Below the Caloosahatchee is the Pliocene age Tamiami Formation, which consists of clayey sands, sandy clays, shell beds, and some limestone. These sediments form the surficial aquifer system (SAS) beneath the site.

Geologic formations were identified based on lithology. However, the upper 100 to 150 feet of sediment at the site includes variable sequences of siliclastic (sand, silt, and clay) and carbonate (shell, limestone) sediments within undifferentiated formations. In order to characterize this variability in the near surface stratigraphy at a scale that is smaller than formal lithostratigraphy, these sequences were given informal designations in order to correlate between boreholes.

Since the site formations above the Hawthorne Group are largely undifferentiated, a series of informal stratigraphic units were adopted for the Project site investigation. Stratigraphic units A through C were identified on the basis of predominant lithology. The following summarizes the general lithology of each of the site-specific informal units:

- Informal Unit A is predominantly brown to gray sand and silty sand;
- Unit B is predominantly gray clayey sand;
- Unit C is largely a mixture of gray fine sand and/or silty sand with variable shell content, with some intervals being mostly shell, and with some cemented fragments and limestone.

The most obvious delineation of subsurface materials is the presence of the predominantly sandy, silty and clayey soils, Units A and B, respectively, above the more shelly sand material (Unit C). The clayey sand layer (Unit B), where present, is underlain by either silty sand with little to no shell content, or silty sand to poorly graded sand with some shell to mostly shell, or silty sand with cemented fragments. The predominantly shelly sand sediments extend down to the maximum depth drilled over most of the site (30 to 75 ft bls), and are grouped as Informal Unit C. Some interbedded clayey sands, sandy limestones, and cemented sands are present within Unit C.

The lithologic information obtained during the Preliminary Design phase was added to the previous site data to update the evaluation of the extent and thickness of the informal units across the site as discussed in the following sections.

8.3.1 Shallow Sand, Silty Sand, Clayey Sand (Informal Units A & B)

The lithology of the unit identified as Informal Stratigraphic Unit A is predominantly a dark brown to dark gray silty fine sand, with roots and a trace of clay in places. The predominant USCS classification for Unit A is SM, SP-SM, or SP. Unit A grades vertically into a clayey fine sand (Unit B) over most of the site. Unit B consists of brown to light grayish brown to gray clayey sand (SC) with clay inclusions and some shell, to light gray clay. The predominant USCS classification for Unit B is SC or CL. Unit A and B are differentiated lithologically where Unit A is predominantly sand or silty sand and Unit B is a predominantly clayey sand or clay. From borehole data at the Project site, the shallow sandy deposits (Units A) average approximately 5 feet thick and range from approximately 0 to 16 feet in thickness across the Project site. Unit A appears to be thickest along portions of the proposed southern reservoir embankment alignments, and in areas of STA cells 1 and 2. Localized areas of thick Unit A deposits are observed in the center of the proposed reservoir and along the western reservoir alignment. The thinnest areas of Unit A appear to be in the northern portion of the proposed reservoir, and in portions of the proposed STA cells 5 and 6 (Figure 8.3).

The deposits designated as informal Unit B average approximately 6 feet thick, and range in thickness from approximately 0 to 18 feet. Unit B appears to be thickest along portions of the western, northern and northeastern Project site boundaries, and in STA cells 2, 4, and 6 (Figure 8.4). It is thicker along portions of the western and northern Reservoir embankment, as well as the southeast corner. The thinnest areas of Unit B at the Project site appear to be in the vicinity of the southern and eastern alignments of the proposed reservoir embankment.

Unit B grades vertically into a predominantly silty sand (SM) in some areas of the site. Percent fines analyses within this silty sand range from approximately 12 to 19 percent. Where Unit B is not present, this silty sand is grouped as part of Unit A due to the fines content. Where Unit B is present, the silty sand is considered to be part of Unit A+B.

The fines content is observed to generally decrease with depth as the more shelly sands of Unit C are approached. Grain size analysis of percent fines of samples in both Units A and B (Figure 8.5) indicate that the units are variable, however, the fines content when plotted against elevation shows an increasing trend with decreasing elevation in the upper part of the section representing Unit A and Unit B until an elevation of approximately 18 feet NAVD 88, where the trend begins to reverse (decreasing fines with decreasing elevation) in the deeper sand/shell unit. The highest percent fines content is generally within the elevation range of 16 to 22 feet NAVD 88, which corresponds to the average elevation range of the clayey sands of Unit B.

Figure 8.6 shows the combined thickness of Unit A and B across the project site, including the silty sand that is present in some areas of the site below what is classified as Unit B. The shallow portion (upper approximately four feet) of Informal Units A and B will make up the borrow material to be used for the construction of the C-44 reservoir and STA embankments. The remaining thickness of Unit A+B will act to reduce the seepage losses through the Reservoir and STA interior bottom.

8.3.2 Sand and Shell (Informal Unit C)

As mentioned, the most obvious delineation of subsurface materials is the presence of the predominantly sandy, silty and clayey soils, Units A and B, respectively, above the more shelly sand material (Unit C). Informal stratigraphic Unit C consists of predominantly sand with shell (varying amounts of shell), some predominantly shell layers, and some cemented fragments. The upper portion of Unit C typically consists of light brownish gray to gray to dark gray fine sand to slightly silty fine sand (SP to SP-SM), silty sand (SM) with variable shell content, or well graded sand (SW) with variable shell content. Generally the shell deposits observed within Unit C consist of a well graded SW and an SP or SP-SM. Shell content in these materials ranges from trace up to 75% of the unit. Most of the shell will pass a No. 4 sieve (coarse sand). A decrease in fines content relative to Units A and B is observed in Unit C from elevations of approximately 16 to 2 feet NAVD 88.

Informal stratigraphic Unit C was partially penetrated by most of the borings drilled on site, and fully penetrated by three deep geologic borings drilled on site. The top of Unit C is encountered in borings at depths ranging from 3 to 23 feet bls with an average depth of 12 feet bls (elevations ranging from +22 ft to + 4 ft NAVD 88). The depth to the top of Unit C is represented on Figure 8.6 (thickness of Unit A+B).

8.3.3 Site Hydrostratigraphy

Martin County, including the project area, is underlain by two aquifer systems, the Surficial Aquifer System (SAS) and the Florida Aquifer System (FAS). The SAS is most relevant to the Project since it encompasses the upper approximately 125 feet of strata at the site. A description of the SAS aquifer in the Project area, and updated water level data, is provided in the following sub-sections.

Surficial Aquifer System

The SAS in Martin County provides most of the potable water used in the county, and generally consists of a sand/soil zone (thickness ~20-50 feet) of low to medium permeability, underlain by a producing zone (thickness ~40 to 50 feet) capable of providing relatively large quantities of water (Butler and Padget, 1995; Adams, 1992). The producing zone is underlain by a slightly lower permeability layer of calcareous mud, mudstone, sandstone and some limestone (thickness ~30 to 60 feet) (Adams, 1992).

The SAS at the C-44 Project site is consistent with the literature, and consists of an upper soil/sand to clayey sand (informal stratigraphic Units A and B) with a thickness of approximately 4 to 25 feet, underlain by a higher permeability sand and shell zone (informal stratigraphic Unit C) with a thickness of approximately 100 feet. The lower portion of the sand and shell units appear more clayey, and could represent the lower permeability portion of the production zone as reported by Adams (1992).

A baseline monitoring program has been implemented at the Project site that includes the collection of water level data in the surficial aquifer and monthly reports to the District. A summary of the water level data from on-site monitoring wells from October 2005 to May 2006 is included in Table 8.4. A ground-water elevation contour map was constructed for the shallow surficial aquifer based on ground-water elevations obtained from shallow piezometers on-site for May 6, 2005 (Figure 8.7). Groundwater elevation data show that groundwater flow in the shallow surficial aquifer at the Project site is generally to the south and toward drainage canal D-2.

8.4 Preliminary Design Laboratory Testing

The laboratory testing program for this investigation included tests for percent fine content, grain size distribution, and soil cement testing of material from the Test Cell area. Samples were obtained during the drilling program from CBs, AB, and test pits (TP).

8.4.1 Particle Size Analysis and Fines Content

Particle size analyses consisted of determining the fines content (soil finer than the No. 200 sieve) of the selected samples and mechanical and hydrometer particle size determination of selected samples. For the fines content, the samples were dried and then washed over a US No. 200 mesh sieve. The percentage of soil, by weight, passing the sieve is the percentage of fines, or portion of the sample in the silt and

clay size range. The results of percent fines tests performed on samples from CBs are presented in Table 8.5 (as well as Figure 8.5). Results of Preliminary Design Phase testing correlate with those obtained during previous investigations with similar fines contents at various depth intervals.

Two grain size distribution analyses were run for bulk samples of Unit C (shelly sand) material obtained from material stock piles developed during the Test Cell construction. For construction purposes, Unit C material has been designated as soil Type 2 (Unit A+B was designated as soil Type 1). These gradation curves are plotted along with samples previously obtained during the BODR exploration phase. These curves (Figure 8.8) demonstrate that bulk samples from excavations in the southwest portion of the site (Test Cell area) are an average representation of materials present throughout the site.

8.5 Geotechnical Site Conditions Update

Results of explorations within the new property, as well as additional explorations around the site, indicate similar findings as BODR explorations. A layer of low blowcount clayey material found under the northern Reservoir embankment at depths of approximately 45 to 50 feet was evaluated for consolidation settlement as discussed in Volume 3, and preliminary analysis indicates this material will not be a concern for embankment stability. Additional CPTs may be performed during the Intermediate Design Phase to further evaluate the potential for consolidation settlement.

Borings located at proposed structures show adequate strength materials are present for either shallow or deep foundations depending on the type of structure. Some relatively low blowcount material was encountered intermittently down to a depth of approximately 50 ft at the Citrus Blvd. bridge location, however preliminary pile capacity analysis indicate foundation materials possess the required strength for these structures.

8.5 Summary and Conclusions

Based on the information obtained during previous investigation of the site, and during the Preliminary Design phase, the C-44 Reservoir/STA Project site appears to satisfy the evaluation criteria for the construction of the proposed project. As discussed, the site is underlain by predominantly sandy soils that are suitable for the support of the reservoir, STAs, and associated structures.

The soils to a depth of about 12 ft (Unit A+B) appear to be suitable for use as earthfill. Borrow material for the construction of the Reservoir and STA embankments will probably consist of the upper approximately four feet of material excavated from within the interior of the Reservoir and STAs. The reason for the shallow cut depth for the borrow material is to ensure that the silty and clayey sand material above the Unit C shelly sand material is not breached during the construction process, since these materials will act as a confining unit between the reservoir and STA bottom and the more permeable units below.

The geotechnical investigation presented herein indicates that the site is suitable for the proposed Reservoir, pump station, and other structures. The Project component designs are presented in Volumes 2 through 4 of the Preliminary Design Report Package.

Occasional deposits of organic material or low strength materials were encountered during the field exploration program. The shallow organic deposits appear to be randomly distributed and have likely remnants from the historical wetlands that once occupied the site. These deposits may have been removed or redistributed in some areas due to site work (ditching and fill placement) required for citrus cultivation. Additional shallow auger borings are recommended to delineate these materials.

8.6 References

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TABLES

Table 8.1
Quantity of Explorations Performed at Site During Preliminary Design

Exploration Type	No. of Explorations	Total Footage
CB	51	3,107
AB	8	120

Table 8.2
Rotary Wash Boring Summary for Preliminary Design

Core Boring ID (CB)	Easting	Northing	Depth (ft)
CP05-IR44-CB-367	832078	1011988	75.0
CP05-IR44-CB-367B	832078	1011988	75.5
CP05-IR44-CB-368	834117	1011987	75.0
CP05-IR44-CB-368B	834117	1011987	75.5
CP05-IR44-CB-369	837230	1011943	75.0
CP05-IR44-CB-369B	837230	1011943	75.5
CP05-IR44-CB-370	840336	1011960	75.0
CP05-IR44-CB-370B	840336	1011960	75.5
CP05-IR44-CB-371	841491	999673	75.0
CP05-IR44-CB-372	841454	1000700	50.0
CP05-IR44-CB-373	841454	1001685	75.0
CP05-IR44-CB-374	841453	1002702	50.0
CP05-IR44-CB-375	841481	1003675	75.0
CP05-IR44-CB-376	841482	1004695	50.0
CP05-IR44-CB-377	841517	1005734	75.0
CP05-IR44-CB-378	840726	998081	75.0
CP05-IR44-CB-379	840794	998011	75.0

Table 8.2 (Continued)
Rotary Wash Boring Summary for Preliminary Design

Core Boring ID (CB)	Easting	Northing	Depth (ft)
CP05-IR44-CB-380	840888	998125	75.0
CP05-IR44-CB-381	840836	998204	75.0
CP05-IR44-CB-382	840591	998312	75.0
CP05-IR44-CB-383	840584	978341	75.0
CP05-IR44-CB-384	840771	978486	110.0
CP05-IR44-CB-385	840733	986033	50.0
CP05-IR44-CB-386	840757	984189	50.0
CP05-IR44-CB-387	840693	982369	50.0
CP05-IR44-CB-388	840761	980529	50.0
CP05-IR44-CB-389	844032	1007180	30.0
CP05-IR44-CB-390	841420	1007673	75.0
CP05-IR44-CB-391	841444	1008631	50.0
CP05-IR44-CB-392	841429	1009648	75.0
CP05-IR44-CB-393	841084	1010825	110.0
CP05-IR44-CB-394	841392	1011697	50.0
CP05-IR44-CB-395	843142	1012056	30.0
CP05-IR44-CB-396	845584	1012064	30.0
CP05-IR44-CB-397	842822	1009770	30.0
CP05-IR44-CB-398	844180	1010714	30.0
CP05-IR44-CB-399	845928	1009315	30.0
CP05-IR44-CB-400	844216	1008194	30.0
CP05-IR44-CB-401	847213	1012034	30.0
CP05-IR44-CB-402	846332	1011225	30.0

Table 8.2 (Continued)
Rotary Wash Boring Summary for Preliminary Design

Core Boring ID (CB)	Easting	Northing	Depth (ft)
CP05-IR44-CB-403	848393	1010944	30.0
CP05-IR44-CB-404	848237	1007486	30.0
CP05-IR44-CB-405	846438	1007474	30.0
CP05-IR44-CB-407	847785	1012475	30.0
CP05-IR44-CB-411	850193	982206	75.0
CP05-IR44-CB-412	840874	997884	50.0
CP05-IR44-CB-413	840789	998117	110.0
CP05-IR44-CB-419	841382	1010833	75.0
CP05-IR44-CB-423	848204	982865	75.0
CP05-IR44-CB-424	850273	1012523	110.0
CP05-IR44-MW-406	848551	1012523	50.0

Table 8.3
Auger Boring Summary for Preliminary Design

Auger Boring ID (AB)	Easting	Northing	Depth (ft)
CP05-IR44-AB-408	847427	1011210	15.0
CP05-IR44-AB-409	847584	1008819	15.0
CP05-IR44-AB-410	847487	1007479	15.0
CP05-IR44-AB-414	842124	1011199	15.0
CP05-IR44-AB-415	842262	1007292	15.0
CP05-IR44-AB-416	845818	1007307	15.0
CP05-IR44-AB-417	845619	1009980	15.0
CP05-IR44-AB-418	842305	1009086	15.0

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Table 8.4
Summary of Groundwater Elevations at Project Site

Well	Screen Interval (BGS)		Coordinates		Top of Casing Elevation*	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06
	From	To	Easting	Northing	(NAVD 88)								
MW272S	13	23	829996	997130	23.7	**12.21**	11.76	10.45	10.55	10.83	10.53	10.40	10.51
MW272SI	48	58	829996	997130	24.13		**14.39**	12.98	12.67	13.23	12.82	12.51	12.84
MW272DI	92.5	102.5	829996	997130	24			**12.43**	12.29	12.86	12.46	12.17	12.29
MW273S	13	23	830081	1012350	24.58	**15.16**	14.81	13.42	13.22	13.37	13.19	13.12	13.12
MW273SI	38	48	830081	1012350	24.95	**15.63**	15.27	13.95	14.00	**14.26**		**13.45**	14.02
MW273DI	84	94	830081	1012350	24.06				**13.39**	25.13	22.94		**12.71**
MW274S	21	31	848492	1007240	24.99	**15.40**	15.07	13.91	13.37	13.78	13.60	13.59	13.55
MW274SI	41	51	848492	1007240	25.16	**16.79**	16.38	15.32	14.70	15.17	14.81	14.69	14.57
MW274DI	90	100	848492	1007240	24.5			**13.96**	13.40	13.86	13.44	13.20	
MW274D	144	154	848492	1007240	24.7					**14.34**	13.98	13.69	13.51
MW275S	15	25	841503	978995	27.9	**17.34**	**18.90**	**21.20**	19.31	18.92	18.18	17.40	16.61
MW275SI	50	60	841503	978995	27.77			**18.73**	17.79	17.65	17.12	16.77	16.02
MW275DI	75	85	841503	978995	27.7			**18.51**	17.64	17.54	17.02	16.32	15.70
MW275D	133	143	841503	978995	27.8			**18.49**	17.72	17.64	17.15	18.17	17.42
MW289S	17.5	27.5	840746	991417	20.5		**12.86**	12.37	12.30	12.89	12.13	11.75	11.82
MW289SI	40	50	840746	991417	20.45			11.21	**11.79**	12.01	11.78	11.07	11.47
MW290S	20	30	840601	1012473	28.63			17.51	17.16	17.52	16.94	16.45	16.10
MW290SI	40	50	840601	1012473	28.56	**18.29**	18.12	17.41	17.05	17.41	16.83	16.35	16.00
MW338S	20	25	830039	1003456	24.49	**16.25**	15.82	14.66	14.47	15.26	15.02	15.18	15.12
MW338SI	40	50	830039	1003456	24.81			**15.73**	15.48	16.26	15.88	15.80	15.76
MW343S	20	25	856428	999299	25.91	**15.83**	15.40	13.82	13.31	13.89	13.72	13.63	13.84
MW343SI	45	50	856428	999299	25.59	**15.19**	14.69	13.26	12.86	13.48	13.32	13.26	13.47
MW344S	15	25	856440	990091	21.19	**15.00**	14.07	12.51	12.39	12.83	12.53	12.59	
MW344SI	45	55	856440	990091	21.37	**15.16**	14.22	12.73	12.66	13.08	13.09	13.11	12.54
MW344DI	90	100	856440	990091	21.57			**12.84**	12.95	13.41	13.44	13.45	14.27
MW345S	9.6	19.6	830058	1008498	23.45		**14.35**	13.53	13.46	13.81	13.57	13.68	13.51
MW346S	10	20	835445	1012454	25.16		**13.50**	11.84	10.96	11.16	10.71	10.50	10.43
MW347S	14	24	840758	996682	23.64		**14.83**	13.55	12.92	13.46	12.82	12.66	12.43
MW348S	10	20	840704	987847	23.12		**14.53**	13.81	13.47	27.61	13.54	13.07	13.61
MW349S	9.5	19.5	848859	983455	23.41		**7.47**	6.58	6.36	6.42	6.40	6.38	6.60
MW350S	9.4	19.4	848581	1001974	26.16		**11.33**	10.22	10.16	10.57	10.42	10.50	9.96
MW351S	7	17	856049	985994	24.66			8.91	9.05	9.32	9.41	9.24	9.21
MW352S	9.2	19.2	856055	994072	23.35		**12.06**	10.58	10.43	10.99	10.90	10.89	11.41
MW353S	9	19	853156	1002000	21.45		**14.34**	12.69	11.91	12.50	11.93	11.54	11.55

* determine by adding or subtracting casing length from ground surface elevation
** deep wells not installed until November 2005
*** Bold denotes that the whole month was not able to be averaged because of a lack of data

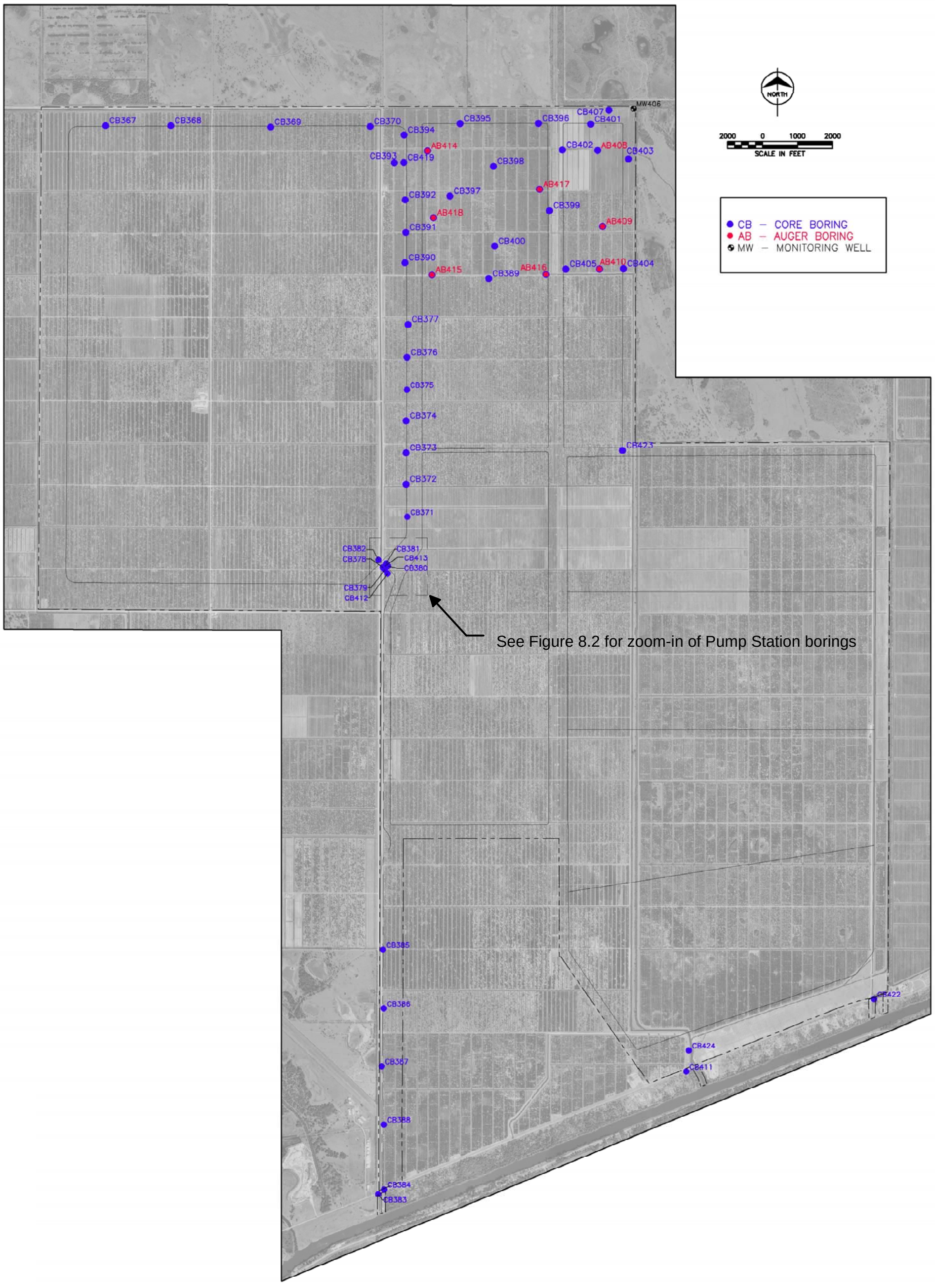
Table 8.5
Percent Fines Test Results for Core Borings Performed During Preliminary Design

Core Boring ID (CB)	Depth Interval		% Fines Content
	From (ft)	To (ft)	
CP05-IR44-CB-367	11.0	14.0	5.0
CP05-IR44-CB-367	43.5	53.5	47.0
CP05-IR44-CB-367	58.5	63.5	46.8
CP05-IR44-CB-368	4.0	6.0	18.6
CP05-IR44-CB-368	48.5	53.5	30.1
CP05-IR44-CB-368	58.5	63.5	45.2
CP05-IR44-CB-368	63.5	68.5	5.1
CP05-IR44-CB-369	4.0	6.0	19.2
CP05-IR44-CB-369	43.5	48.5	30.8
CP05-IR44-CB-369	53.5	58.5	33.8
CP05-IR44-CB-369	63.5	68.5	75.5
CP05-IR44-CB-370	6.0	8.0	17.3
CP05-IR44-CB-370	53.5	58.5	31.1
CP05-IR44-CB-370	68.5	73.5	90.4
CP05-IR44-CB-371	6.0	8.0	31.9
CP05-IR44-CB-371	48.5	53.5	21.8
CP05-IR44-CB-371	53.5	58.5	19.7
CP05-IR44-CB-372	10.0	12.0	25.1
CP05-IR44-CB-375	6.0	8.0	18.1
CP05-IR44-CB-375	12.0	14.0	4.8
CP05-IR44-CB-376	2.5	6.5	27.1
CP05-IR44-CB-376	6.5	8.5	23.8
CP05-IR44-CB-376	14.0	18.5	5.9
CP05-IR44-CB-377	5.0	9.0	18.2
CP05-IR44-CB-377	9.0	10.0	23.2
CP05-IR44-CB-378	38.5	43.5	11.3
CP05-IR44-CB-378	43.5	48.5	29.6
CP05-IR44-CB-378	48.5	53.5	39.6
CP05-IR44-CB-379	38.5	43.5	12.3
CP05-IR44-CB-379	43.5	48.5	41.7
CP05-IR44-CB-379	48.5	53.5	33.9
CP05-IR44-CB-380	4.0	6.0	24.0
CP05-IR44-CB-380	38.5	43.5	28.5
CP05-IR44-CB-380	43.5	48.5	48.1
CP05-IR44-CB-380	48.5	53.5	8.9
CP05-IR44-CB-381	4.0	6.0	15.1
CP05-IR44-CB-381	6.0	8.0	40.2
CP05-IR44-CB-381	43.5	48.5	32.6
CP05-IR44-CB-381	48.5	53.5	41.4

Table 8.5 (Continued)
Percent Fines Test Results for Core Borings
Performed During Preliminary Design

Core Boring ID (CB)	Depth Interval		% Fines Content
	From (ft)	To (ft)	
CP05-IR44-CB-382	10.0	12.0	13.2
CP05-IR44-CB-382	43.5	48.5	38.5
CP05-IR44-CB-382	48.5	50.0	17.7
CP05-IR44-CB-383	18.5	23.5	11.1
CP05-IR44-CB-384	2.0	4.0	81.6
CP05-IR44-CB-385	8.0	10.0	19.8
CP05-IR44-CB-386	4.0	6.0	22.3
CP05-IR44-CB-390	6.0	8.0	23.9
CP05-IR44-CB-391	8.0	10.0	17.8
CP05-IR44-CB-392	4.0	6.0	16.3
CP05-IR44-CB-392	58.5	63.5	51.9
CP05-IR44-CB-392	63.5	68.5	63.6
CP05-IR44-CB-392	68.5	73.5	65.9
CP05-IR44-CB-393	12.0	14.0	17.8
CP05-IR44-CB-394	6.0	8.0	17.8
CP05-IR44-CB-395	8.0	10.0	15.4
CP05-IR44-CB-396	6.0	8.0	25.2
CP05-IR44-CB-396	8.0	10.0	24.7
CP05-IR44-CB-397	12.0	14.0	21.6
CP05-IR44-CB-398	6.0	8.0	19.6
CP05-IR44-CB-398	8.0	10.0	18.9
CP05-IR44-CB-399	4.0	6.0	21.6
CP05-IR44-CB-399	6.0	8.0	21.6
CP05-IR44-CB-400	6.0	8.0	20.6
CP05-IR44-CB-400	8.0	10.0	21.0
CP05-IR44-CB-401	2.0	4.0	16.7
CP05-IR44-CB-401	10.0	12.0	19.8
CP05-IR44-CB-401	12.0	14.0	23.2
CP05-IR44-CB-401	23.5	28.5	8.4
CP05-IR44-CB-403	12.0	14.0	15.6
CP05-IR44-CB-404	10.0	12.0	22.3
CP05-IR44-CB-404	12.0	14.0	28.1
CP05-IR44-CB-404	28.5	30.0	91.5
CP05-IR44-CB-405	8.0	10.0	26.8
CP05-IR44-CB-407	8.0	10.0	14.8
CP05-IR44-CB-407	10.0	12.0	43.4
CP05-IR44-MW-406	18.5	23.5	14.2

FIGURES



Source: KATIE_BORINGS_DETAILS-6-30-06.DWG.tif

Figure File Name: Fig8.1 _PD Explor Locations_KES_062806.grf

Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

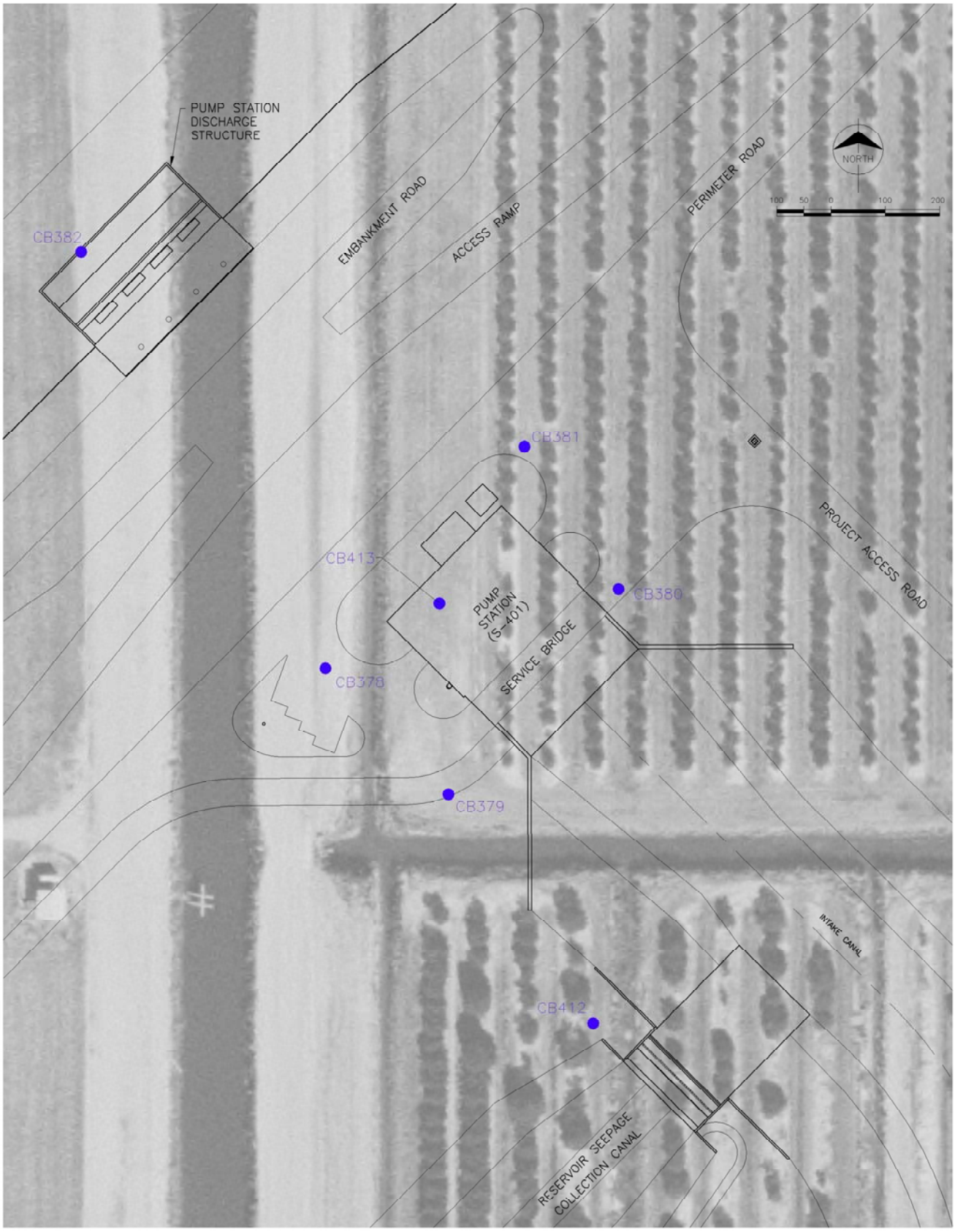
HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

Preliminary Design Exploration Locations

C-44 Reservoir/STA Project
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.1



Source: KATIE_BORINGS_ZOOM.tif

Figure File Name: Fig8.2 _PD Pump Station Explor_KES_062806.grf

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CA 4213

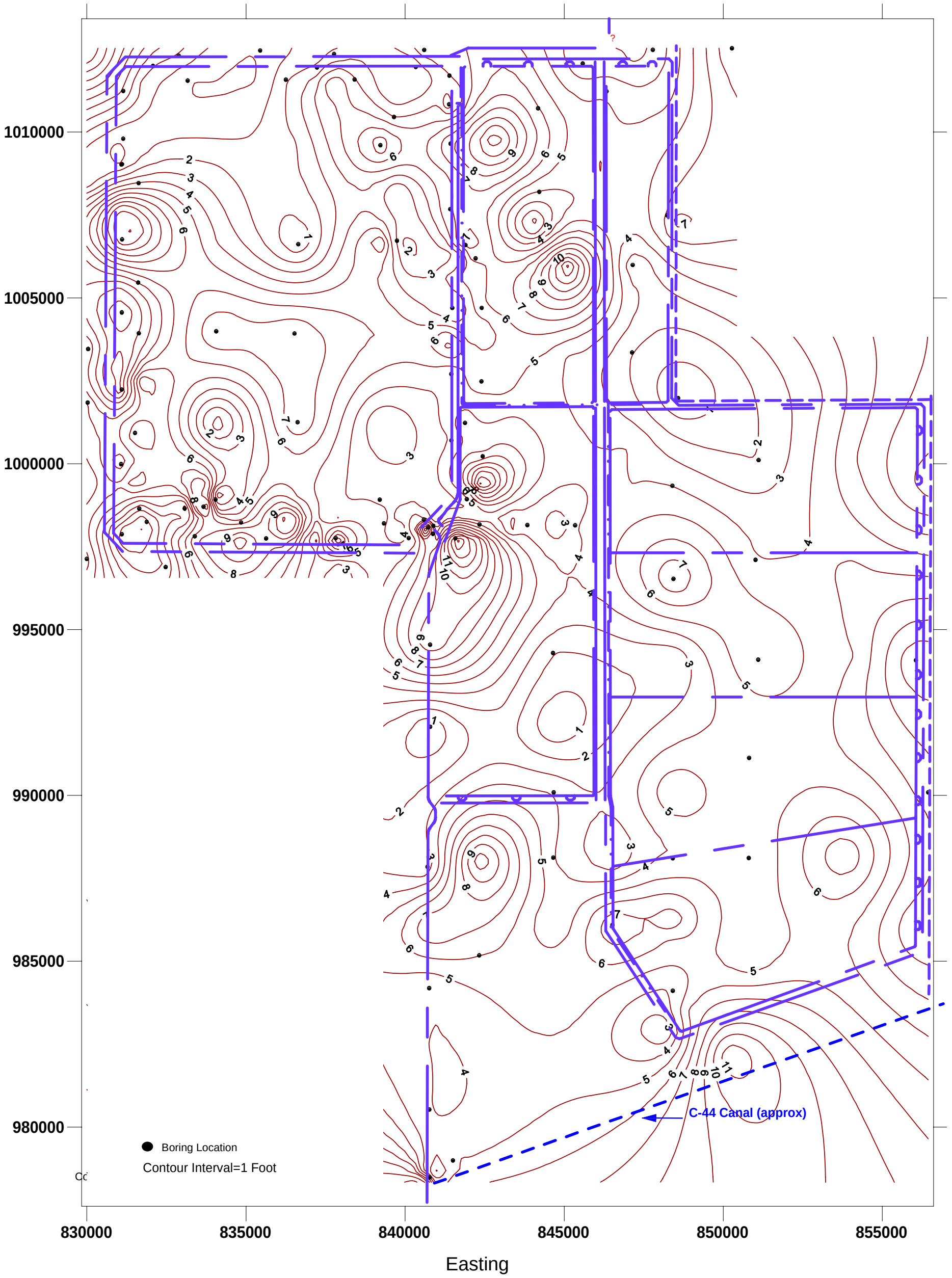
Preliminary Design Exploration Locations
Pump Station

C-44 Reservoir/STA Project
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.2

Unit A Thickness



Source: UnitAthk.wmf, UnitAthk.srf

Figure File Name: Fig8.3 _Unit A thickness_KES_062806.grf

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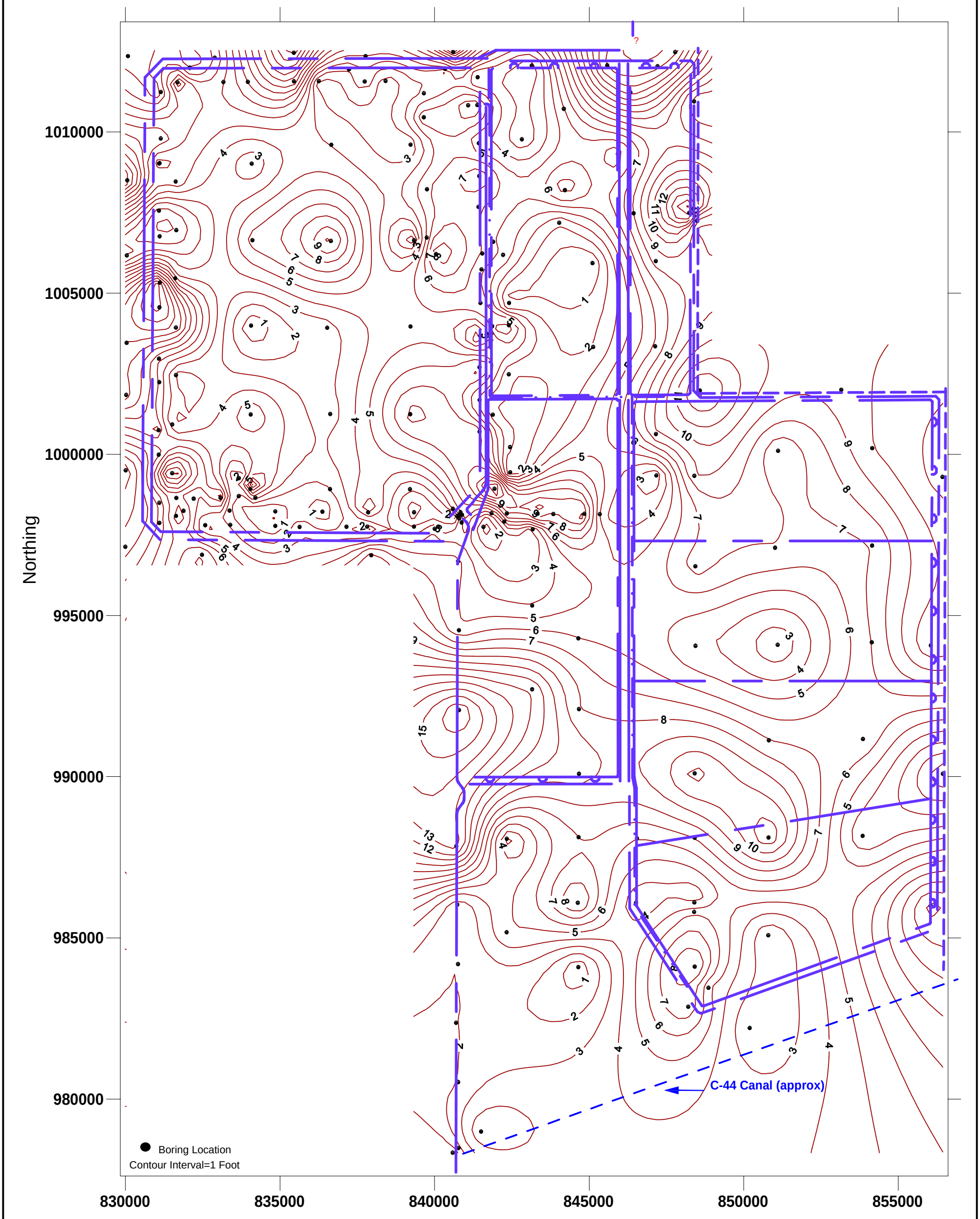
Thickness of Informal Stratigraphic Unit A

C-44 Reservoir/STA Project
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.3

Unit B Thickness



Source: UnitBthk.wmf, UnitBthk.srf

Figure File Name: Fig8.4 _Unit B thickness_KES_062806.grf

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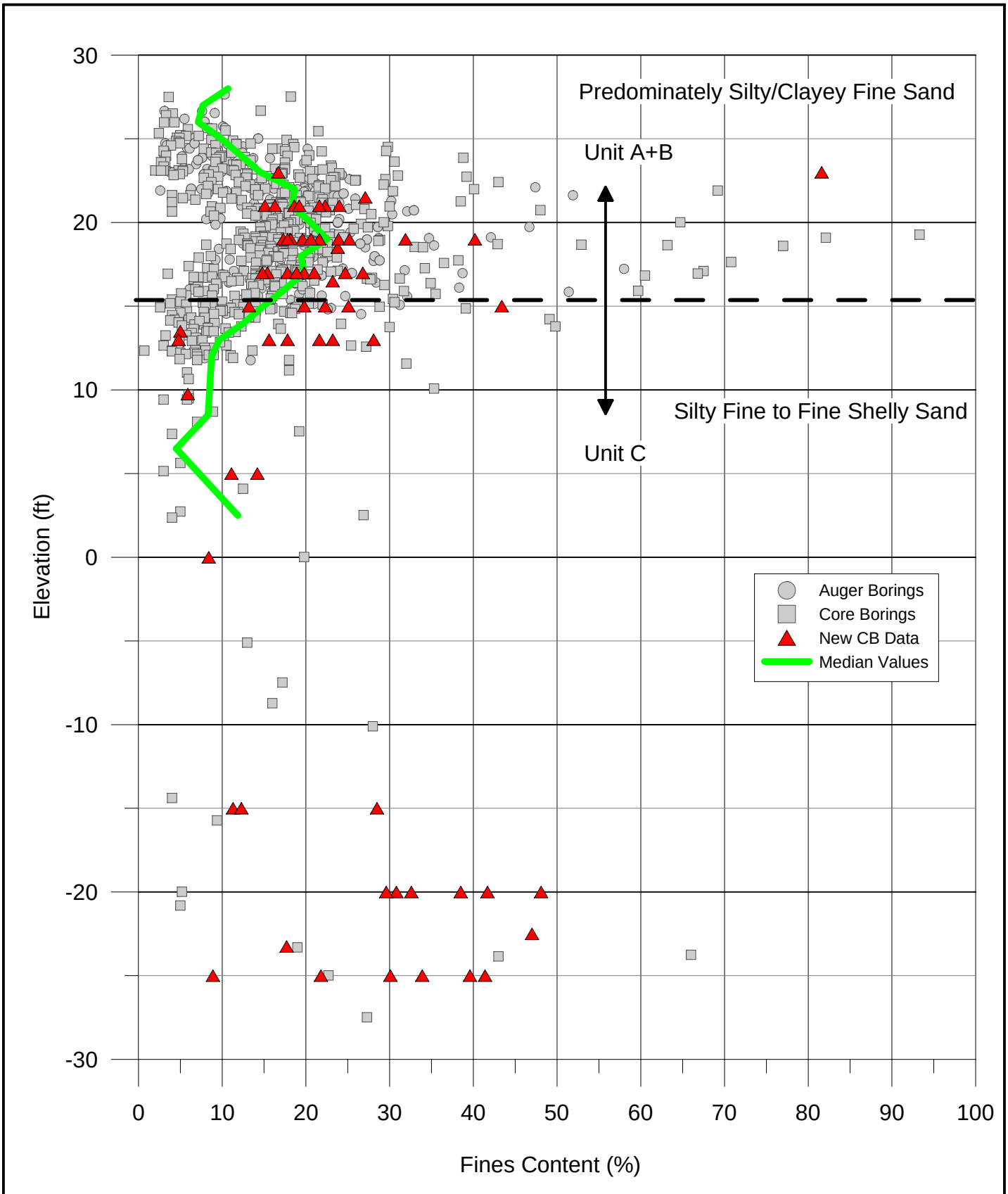
Thickness of Informal Stratigraphic Unit B

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.4



Reference: Section 8_Tables_KES_062806.xls

Figure File Name: Fig8.5 _%Fines vs Elevation_06280606.grf

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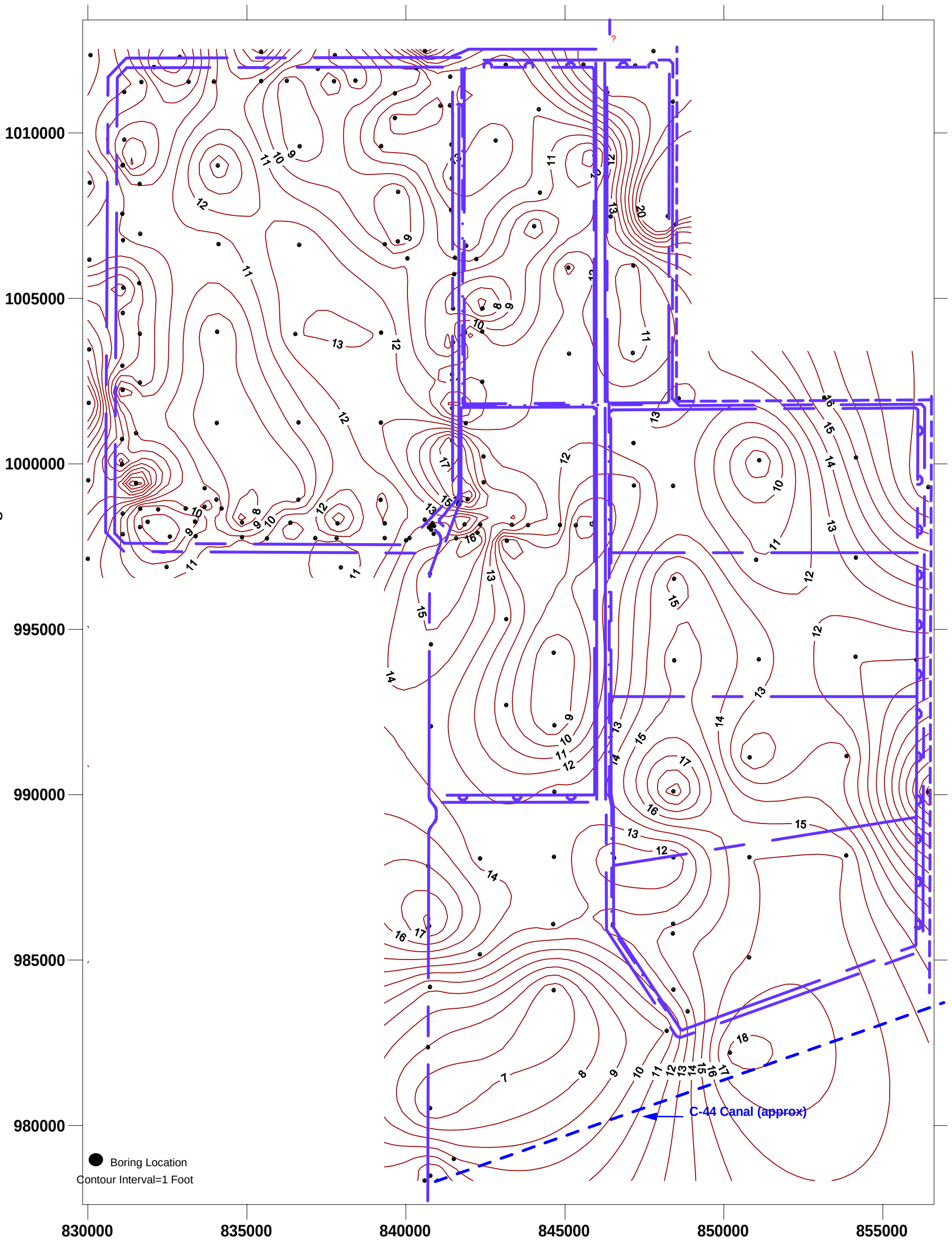
Laboratory Fines Content vs. Elevation Update

C-44 Reservoir/STA Project
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.5

Unit A+B Thickness



Source: UnitABthk_basalSM.wmf, UnitCthk.srf

Figure File Name: Fig8.6 _Unit A+B thickness_KES_062806.grf

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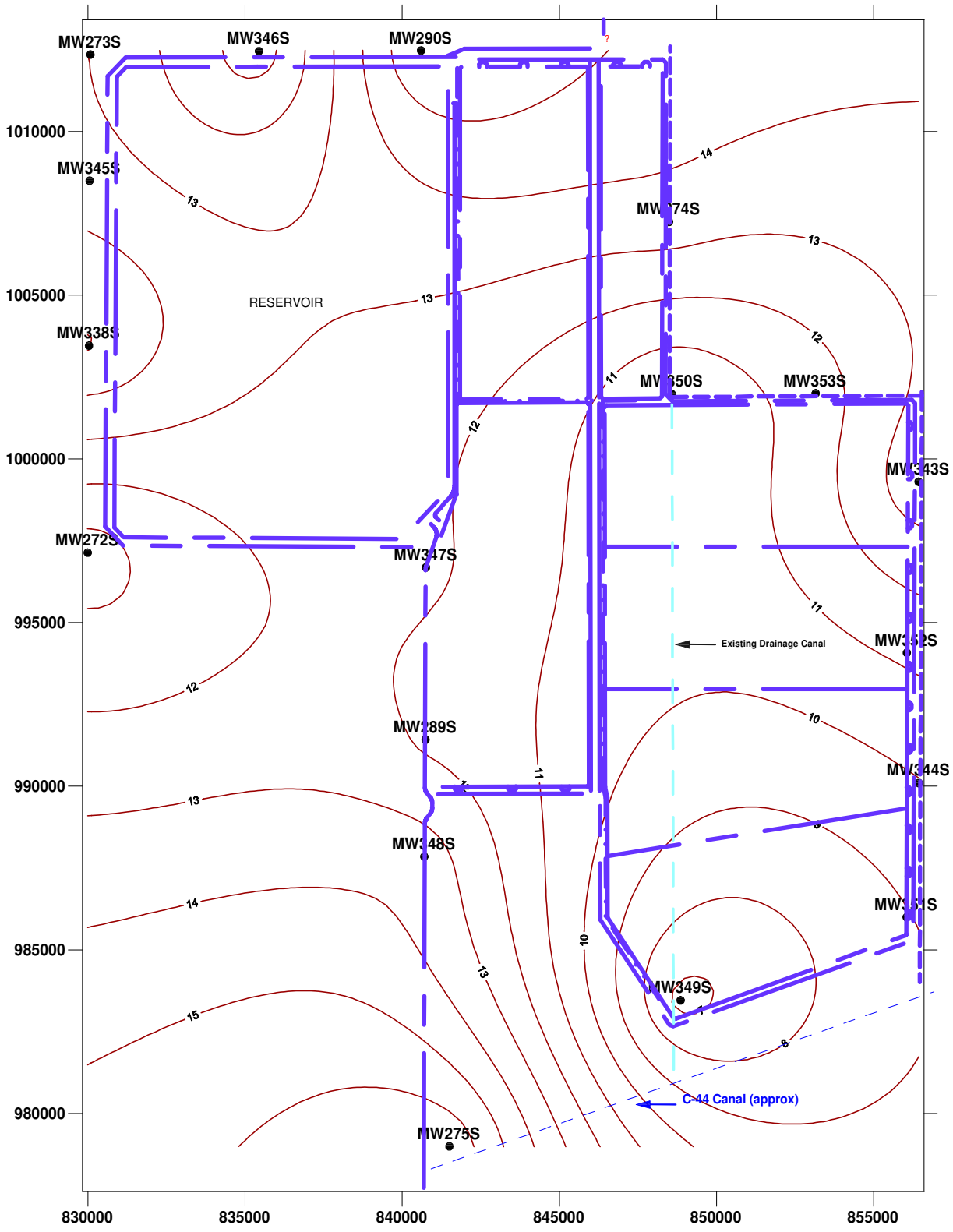
Thickness of Informal Stratigraphic Unit A+B

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.6

May 6, 2006



Source: 050606.srf

Figure File Name: Fig8.7_May2006Contour_dmd_053106.grf

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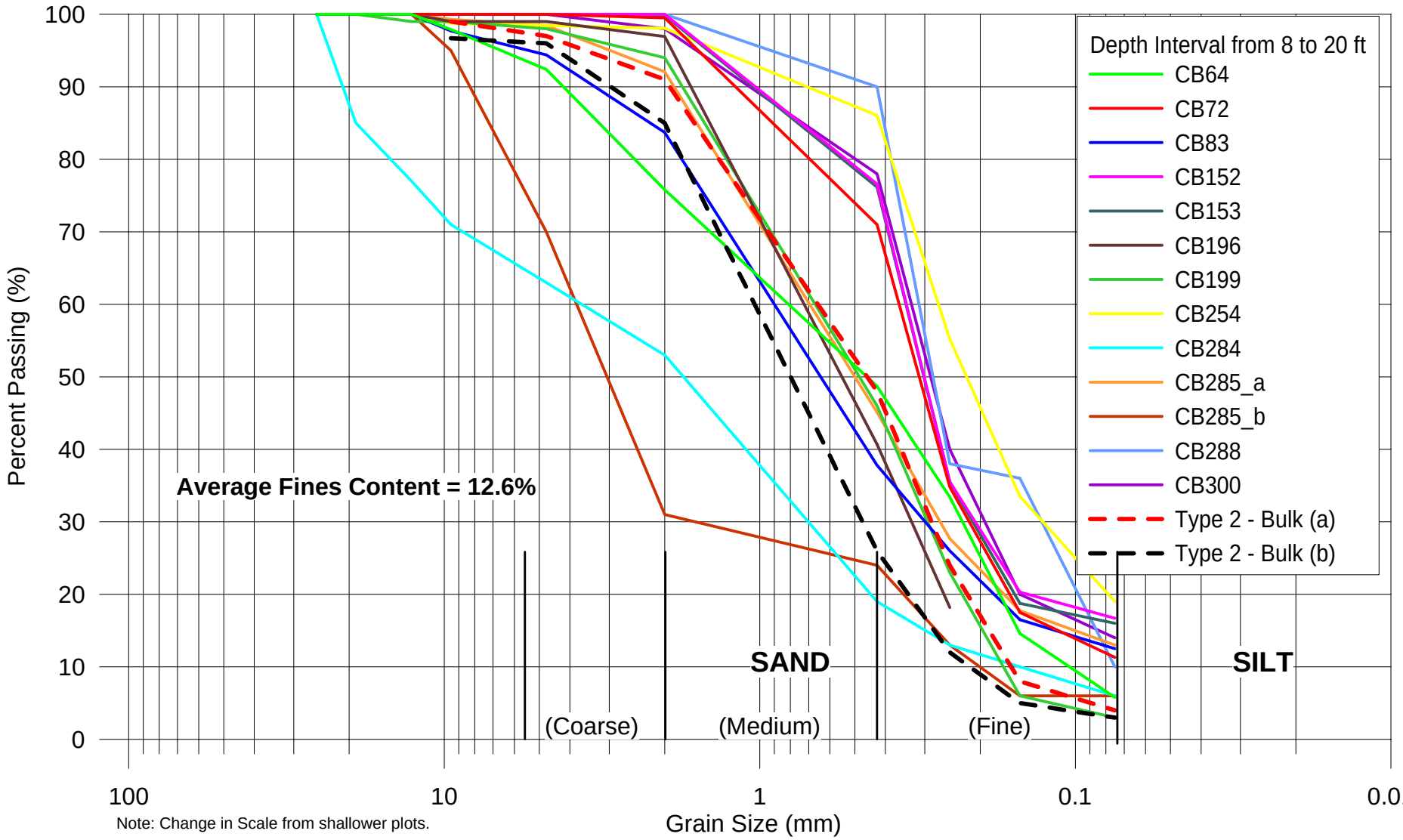
CA 4213

Shallow Surficial Aquifer Groundwater Elevation Contours May 6, 2006

C-44 Reservoir/STA Project
Preliminary Design Report
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.7



Note: Change in Scale from shallower plots.

Source: Section 8_Tables_KES_062806.xls
Reference: Ardaman & Associates Geotechnical Site Investigation and Laboratory Testing Report, dated September 2005

Figure File Name: Fig8.8 _8 to 20 GrainSize_KES_062806.grf

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Tel # (561) 242-5520

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SUITE 250
TAMPA, FL 33607
CA 4213

Laboratory Grain Size Analysis Test Results
Depths 8 to 20 ft with 2 Bulk Samples

C-44 Reservoir/STA Project
Contract# CN040918-WO12

DATE
07/06/2006

FIGURE
8.8

9.0 LIST OF TECHNICAL SPECIFICATIONS

This section presents an outline of the Technical Specifications that will be included in the final Construction Documents for the Project. The outline is broken down as follows:

- Division of Work
- Section and Title
- Applicability to the Major Divisions of the Project

The following abbreviations are used throughout the outline:

- All – means that the referenced specification section applies to all of the major divisions of work
- R – Reservoir
- STA – Stormwater Treatment Area
- TIWCD – Troup Indiantown Water Control District Pump Station
- PS – Reservoir Pump Station
- CB – Citrus Boulevard

The SFWMD list of standard technical specifications was used as a basis for the development of this list. Additional specifications from the HDR master specifications list were included to describe specific types of products and work associated with the project.

Division 1 – General Requirements

Section	Title	Contract
01010	Summary of Work	ALL
01015	Definitions and Standards	ALL
01020	Measurement and Payment	ALL
01050	Field Engineering	ALL
01065	Permit and Fees	ALL
01071	Standard References	ALL
01200	Project Meetings and Reports	ALL
01300	Submittals	ALL
01310	Construction Schedules	ALL
01380	Construction Videos and Photographs	ALL
01410	Testing and Quality Control	ALL
01510	Temporary Utilities and Facilities	ALL
01530	Temporary Barriers and Controls	ALL

Section	Title	Contract
01531	Wildlife Protection	ALL
01570	Traffic Control	ALL
01580	Project Identification and Signs	ALL
01590	Field Offices and Sheds	ALL
01600	Equipment and Materials	ALL
01630	Product Options and Substitutions	ALL
01640	Manufacturer's Field Services for Contractor Supplied Equipment	ALL
01641	Manufacturer's Field Services for Owner Furnished Equipment	ALL
01660	Equipment and System Performance and Operational Testing	ALL
01665	Equipment Vibration Testing	ALL
01670	Equipment Alignment	ALL
01700	Contract Closeout	ALL
01730	Operation and Maintenance Information	ALL

Division 2 – Site Work

Section	Title	Contract
02100	Site Preparation	ALL
02110	Clearing and Land Preparation	ALL
02114	Tree Removal	R,STA
02200	Earthwork	ALL
02210	Embankment Construction	R,STA,TIWCD
02220	Excavation and Backfilling	ALL
02221	Trenching, Backfilling and Compacting	ALL
02230	Roadway Excavation, Backfill and Compaction	ALL
02232	Limerock Base	ALL
02233	Shellrock Base	ALL
02240	Soil Stabilization	ALL
02262	Steel Sheet Piling	PS, TIWCD
02335	Roadway Base Course	ALL
02355	Test Piles	PS
02360	Drilled Shaft Piling	PS
02367	Foundation Piling (Prestressed Concrete)	PS
02370	Riprap System	ALL
02401	Dewatering and Cofferdam	TIWCD,CB
02431	Catch Basins, Frames and Grates	ALL
02434	Culverts	ALL
02435	Turbidity Control & Monitoring	ALL
02436	Environmental Protection	ALL
02437	Sand-Cement Bag Slope Protection	ALL
02451	Guardrail	STA,PS,TIWCD,CB
02480	Landscaping	ALL

Section	Title	Contract
02486	Grassing	ALL
02510	Miscellaneous Concrete Slabs, Curbs, Sidewalks	ALL
02513	Asphaltic Concrete Paving	R,CB,PS
02520	Soil Cement	R
02576	Bituminous Pavement Sealing	CB
02577	Pavement Marking	R,CB,PS
02580	Drilling & Testing of Wells	PS
02660	Groundwater Monitoring Wells	R,STA
02713	Water Systems	PS
02740	Septic Systems	PS
02781	Staff Gauges	R,STA,TIWCD
02820	Fences and Gates	ALL
02821	Security Fencing	ALL
02950	Exotics Removal	ALL

Division 3 – Concrete

Section	Title	Contract
03100	Concrete Formwork and Accessories	ALL
03200	Concrete Reinforcement	ALL
03300	Cast-In-Place Concrete	ALL
03400	Structural Precast Concrete	ALL
03600	Grout	ALL

Division 4 – Masonry

Section	Title	Contract
04220	Concrete Unit Masonry	PS
04230	Reinforced Unit Masonry	PS

Division 5 – Metals

Section	Title	Contract
05060	Welding	ALL
05070	Bolted Fasteners	ALL
05100	Structural Steel	ALL
05120	Steel Grating	ALL
05200	Open Web Steel Joists	ALL
05210	Metal Roof Deck	ALL
05521	Handrails, Railings and Guardposts	ALL
05550	Fabricated Metalwork and Castings	ALL
05600	Miscellaneous Metals	ALL

Division 6 – Woods

Section	Title	Contract
06100	Rough Carpentry	ALL

Division 7 – Thermal and Moisture Protection

Section	Title	Contract
07200	Insulation	PS
07527	SBS-Modified Bituminous Sheet Roofing System	PS
07620	Sheet Metal Flashing and Trim	PS
07860	Prefabricated Expansion Joints	PS
07920	Sealants and Caulkings	PS

Division 8 – Doors and Windows

Section	Title	Contract
08110	Hollow Metal Doors and Frames	PS
08305	Access Doors	PS
08333	Overhead Coiling Doors	PS
08520	Aluminum Windows	PS
08700	Finish Hardware and Accessories	PS
08800	Glass and Glazing	PS

Division 9 – Finishes

Section	Title	Contract
09300	Tile	PS
09510	Acoustical Ceilings	PS
09650	Resilient Flooring	PS
09805	Coal-Tar Epoxy Coating Systems for Steel Tie Rods and Accessories	PS
09900	Protective Coatings	PS

Division 10 – Specialties

Section	Title	Contract
10200	Fixed Wall Louvers	PS
10522	Fire Extinguishers, Cabinets and Accessories	PS
10800	Toilet and Bath Accessories	PS

Division 11 – Equipment

Section	Title	Contract
11000	General Requirements for Equipment	ALL

Section	Title	Contract
11002	Equipment Mounting	ALL
11062	Vacuum Pumping System	PS
10163	Hydropneumatic System	PS
11171	Pump Station Intake Trash Collection System	PS,TIWCD
11075	Well Pump	PS
11078	Hydropneumatic System	PS
11082	Air Compressor and Receiver	PS
11210	Speed Reducers	TIWCD
11213	Mixed Flow Vertical Pumps	PS
11922	Ozone Treatment Package System	PS

Division 12 – Furnishings – NOT USED

Division 13 – Building

Section	Title	Contract
13300	Instrumentation and Controls	ALL
13101	Lightning Protection System	ALL
13310	Monitoring Systems	ALL
13323	Sequence of Operations	ALL
13400	Computer Systems	ALL
13850	Fire Protection System	PS
13900	Security Systems	PS

Division 14 – Conveying System

Section	Title	Contract
14320	Hoist and Monorail System-General	PS
14611	Vertical Lift Gate Operating System	STA

Division 15 – Mechanical

Section	Title	Contract
15000	Piping, General	ALL
15010	General Provisions for Mechanical Work	ALL
15025	Miscellaneous Piping	ALL
16060	Pipe and Pipe Fittings	ALL
15063	Polyvinyl Chloride (PVC) Pipe and Fittings	ALL
15101	Valves and Appurtenances	PS
15105	Miscellaneous Steel Piping and Fittings	PS
15120	Miscellaneous Piping Specialties	PS
15121	Backflow Preventers	PS
15170	Water-Lubricated Pump Bearings	PS
15210	Vacuum Pump System	PS
15250	Insulation for Piping and Equipment	PS

Section	Title	Contract
15410	Plumbing	PS
15500	Fire Protection	PS
15550	Concrete-Encased Fuel Storage Tanks and Accessories	PS
15600	Duplex Sump Pumps	PS
15625	Fuel and Lube Oil System Requirements	PS
15630	Cooling Water and Potable Water Systems	PS
15738	Split-System Heat Pumps	PS
15815	Metal Ducts	PS
15820	Duct Accessories	PS
15838	Power Ventilators	PS
15855	Diffusers, Registers, and Grilles	PS
15861	Air Filters	PS
15990	Testing, Adjusting, and Balancing	PS

Division 16 – Electrical

Section	Title	Contract
16000	Electrical	ALL
16050	Basic Materials and Methods	ALL
16110	Raceways, Boxes, Fittings & Supports	ALL
16120	Wires and Cable	ALL
16121	Medium Voltage Cable	ALL
16135	Electrical - Exterior Underground	ALL
16140	Wiring Devices	ALL
16155	Motor Starters	ALL
16160	Panelboards, & General Purpose Dry-Type Transformers	ALL
16180	Switchboards	ALL
16220	Motors	ALL
16230	Engine Generator - Diesel	ALL
16275	Distribution Transformers	ALL
16272	Substation Power Transformer	ALL
16285	Power Factor Correction Equipment	ALL
16289	Transient Voltage Surge Suppressors	ALL
16340	Medium Voltage Metal - Clad Switchgear Motor Control Center	ALL
16411	Transient Switches	ALL
16440	Service Disconnect	ALL
16450	Grounding	ALL
16490	Overcurrent and Short Circuit Protective Devices	ALL
16500	Lighting	ALL
16721	Fire Alarm Systems	ALL
16950	Field Testing	ALL
16975	Communication and Control System Antenna Tower	ALL

10.0 PROJECT COST ESTIMATE & SCHEDULE

10.1 Introduction

The C-44 Reservoir/STA Project will be constructed on approximately 12,000 acres bounded by Citrus Boulevard and the C-44 Canal to the south, agricultural properties to the west and east, the District's Allapattah Complex to the north, and agricultural and undeveloped property to the north-east. The total Project will include the following primary elements:

- Construction of a Reservoir
- Construction of a Stormwater Treatment Area (STA) divided into seven cells
- Construction of Seepage and Distribution canals
- Construction of an Intake Canal and Paved Entrance Road
- Construction of a Reservoir Pump Station that will lift water from the Intake Canal into the Reservoir
- Reconfiguration of Troup Indiantown Water Control District (TIWCD) Facilities:
    - Construction of an interim irrigation configuration including a temporary pump to ensure that the necessary agricultural needs of the TIWCD can continue to be met during construction of the C-44 Project
    - Construction of a new permanent pump station
- Existing easement modifications including a bridge over the Intake Canal, new box culvert(s) under Citrus Boulevard and other improvements to facilitate operation of the C-44 Project

10.2 Project Schedule

In overview, the C-44 Reservoir/STA Project Schedule can best be shown listing the following critical milestones that will carry the Project from the start of Preliminary Design through construction completion:

- Submit Reservoir/STA1502 Permit Application 07/10/06
- Temporary Reconfiguration of TIWCD Final Design 07/31/06
- Advertise Bid for TIWCD Test Reconfiguration 08/11/06
- Notice to Proceed (NTP) Intermediate Design 08/28/06
- Reservoir/STA Preliminary Design Presented to Governing Board 09/13/06
- Temporary Reconfiguration of TIWCD Contract 10/11/06
- Reservoir/STA Intermediate Design Submittal 10/19/06
- NTP Construction – Temporary Reconfiguration of TIWCD 10/17/06

- Reservoir/STA Pre-Final Design Plans and Specifications 1/22/06
- Reservoir/STA Draft Bid Packages 03/15/07
- Reservoir/STA Final Bid Packages 03/22/07
- Reservoir/STA Project Bid Period 04/06 - 05/15/07
- Reservoir/STA Project Contracts Awarded 06/13/07
- NTP Construction – C-44 Reservoir/STA Project 06/25/07
- Construction of Reservoir/STA Project Complete 12/31/09

The Construction Schedule encompasses a 30-month timeframe (July 1, 2007 to December 31, 2009). A summary of the construction schedule is presented in Figure 10.1 and a detailed Construction Schedule is presented in Volume 5.0.

It will be important for the District to take proactive measures to ensure the highest level of contractor interest in the C-44 Reservoir/STA project. These measures should include an announcement about the project in the Fall of 2006 in all major construction publications and with all major contractor associations such as ABC and AGC indicating major work groups and the anticipated bid schedule. Also, the District should consider convening a project open review/open house for interested contractors in late October or early November 2006, which would include a project site tour, a detailed presentation by HDR of the major elements of the project, and a Question and Answer session with District staff and HDR. If such a session were held, the presentation by the District and HDR should also include a specific bid and construction timeline so that interested contractors that are capable of meeting the technical and management challenges of the project can plan for the C-44 Reservoir/STA project in their Spring 2007 estimating calendar. This would also allow the contractors to assess the impact of a successful bid on their 2007-2009 construction program.

10.3 Opinion of Probable Construction Costs and Project Budget

During the Preliminary Design phase, a number of significant changes were incorporated into the Project. The physical changes to the design are primarily the result of the acquisition of additional land that became available subsequent to the submittal of the final Basis of Design Report (BODR) in April 2006. The cost implications of these changes have been incorporated in the Opinion of Probable Construction Cost (OPCC) presented in detail in Volume 5. In aggregate, the progression of the design, the physical changes of project features, and other related factors resulted in the calculation of an estimated construction cost of $241.3 million. This compares favorably to the estimate presented in the BODR. Overall, the total project costs presented herein remain within the current District budget.

Table 10.1.1 provides a summary of the OPCC. Table 10.1.2 provides a summary of each component of the total project budget – it is similar to the summary provided in the BODR for ease of comparison and analysis.

10.4 Possible Value Engineering Opportunities and Other Cost Items

10.4.1 Value Engineering

Throughout the Preliminary Design phase, the Design Team conducted a number of cost evaluations. The Team has identified a number construction items that may result in cost savings. Some of these items may require a deviation or variance of current District Standards. The items will be presented at the scheduled formal Value Engineering session that is scheduled for the middle of this month.

10.4.2 Other Cost Items

A significant project budget issue is the need for copper impact remediation at the project site.

Copper Remediation

A significant project budget issue is the need for copper impact remediation at the project site. On March 6th, 2006, the corrective action plan commenced on the C-44 Project site. This plan was developed to address impacted point sources, pump stations, mix/load/burn areas, and cultivated areas as identified in the Phase I/II Assessment prepared by Camp Dresser and McKee (CDM), dated December 2004. It includes sampling prior to implementing corrective action to confirm the extent of impacts, corrective action, confirmation sampling, and additional copper sampling of the remaining cultivated areas (i.e., 6,000 acres of 50 acre composite grids) not sampled by CDM. Corrective actions, with the exception of copper-only impacts and lands of recent/pending acquisition, will be completed prior to the end of July 2006 in order to receive a timely "no further action" status from Florida Department of Environmental Protection (FDEP)and the US Fish and Wildlife Service (USFWS).

The areas of copper-only impacts include soils identified within approximately 1,600 acres of cultivated areas (comprised of 50 acre aggregate grids) and 54 mix/load/burn areas. Copper impacts are considered to include those samples found that exceed 85 mg/kg, a limit that has been established USFWS at which conditions may impact the health of the Everglades Snail Kite if impacted soils are in contact with impounded surface water. The majority of the sampling was done at a soil depth of 6 inches. The actual depth of impact has not yet been delineated. Typically the impact is within the first 6 inches of undisturbed soil.

Forty-nine mix/load/burn areas (estimated at 0.3 acres each) have elevated copper at 0-6 inches and five have elevated copper only at elevations greater than 6 inches. Thirty 50-acre cultivated areas and twenty-two 5-acre cultivated areas have elevated copper at 0-6 inches.

Previous cooperative efforts between the South Florida Water Management District (SFWMD) and USFWS have developed remediation strategies that include: 1) capping

the affected undisturbed areas in place with no future disturbance of the soils, 2) "soil inversion" which involves tilling the top layer of undisturbed soil, thereby covering the surface layer with soil from a deeper, previously undisturbed layer, again with no future disturbance of the soils, and 3) removing the soils to a location that will not be in contact with impounded surface water. For the C-44 Project, these techniques create significant challenges relative to management (i.e., tracking soil that looks analogous to other soils across the entire Project site) and cost.

The identified copper impacted areas are located across the C-44 Project site in areas where the Reservoir, embankments, Stormwater Treatment Area cells, and canals will be constructed. A major constraint, due to the type of construction to be performed on site, is the need to set the primary borrow material apart from the top four (4) feet of soil. Thus, it may be impractical to perform either the capping or soil inversion remediation prior to the start of construction or after construction. Most of the soils on the entire site will be disturbed during construction making the characterization of over 1,600 acres in and around the Project site as areas that were off limits to any construction activities impractical to define within a contract.

The remaining remediation strategy of soil removal is stockpiling. Assuming that the copper impacts are within the first 6 to 8 inches of soil, then this translates to approximately 1,700,000 cubic yards of material. This material would not be suitable for embankments since it is organic. Since this material is not allowed to be in contact with impounded surface water, it would need to be stockpiled around the perimeter of the Project site at an approximate cost of $8.5 million (1,700,000 cubic yards at $5 per cubic yard) to move the soil to that location. This amount is included in the Real Estate budget as a separate line item in the Project Cost Summary presented in Table 10.2.

A recommended alternative remediation strategy, which is subject to approval by both the District and USFWS, is soil mixing and post construction testing. Essentially, the impacted soils would not be tracked during construction nor segregated from the active construction areas. Since these soils are unsuitable for embankment materials, most would be spread and mixed into areas that have previously been used for borrow material for the embankments. Specific construction examples are provided below.

Reservoir Embankment and Borrow Area

The footprint area of the embankment would be stripped to a depth of four feet. Suitable material would be used as embankment fill. The floor of the Reservoir would serve as the borrow area for the embankments and would also be stripped to a depth of four feet. Unsuitable material, mainly organics, would be "wasted" to the interior of the Reservoir floor after the borrow material is removed. This wasted material would be spread and mixed with areas where borrow has been removed or placed and mixed in low spots. This includes areas such as canal and ditches that would not be used as part of the Reservoir interior low water drainage system, a system that will direct low level flow to the outlet structure. Once the wasted soil is mixed and placed, confirmatory sampling for copper could be conducted across the floor of the Reservoir based on an approved sampling plan and prior to Reservoir filling. If any areas indicated high levels, these areas could be further mixed followed by confirmatory sampling or capped

with non-impacted materials. At this point, the floor of the reservoir would not be disturbed further. Additionally, the entire interior length of the Reservoir embankment would be covered with a 16-inch layer of soil cement. The District and USFWS would need to agree that this soil cement would be a sufficient cap for any potentially copper impacted soil underneath the soil cement.

Stormwater Treatment Area (STA) Cells and Embankments

The interior of the 6,300 acres of STA cells would be graded such that the nominal water depth with the STA cells would be 1.5 feet. The intent would be to achieve cut and fill balance, such that as grading begins on the upstream side of the STA cell, the excess soils would be pushed downstream into the existing swales and ditches that would only be partially filled in. As with the reservoir embankments, unsuitable organic fill would be wasted to the interior of the STA cells and not utilized in the STA embankments. After all of the soil is graded, confirmatory sampling for copper could be conducted across the floor of the STA cells based on an approved sampling plan and prior to STA filling. If any areas indicated high levels, these areas could be further mixed followed by confirmatory sampling. Additionally, the interior embankments, which would be grass-lined, would also be sampled. If high levels of copper are indicated by the samples, portions of the embankments would possibly need to be reconstructed with mixed soils that are not highly impacted.

Unless the District elects to include approximately $8.5 million in hauling and soil management costs in the project budget, an alternative to the currently accepted remediation methods, as described above, would need formal concurrence by both the District and USFWS prior to the start of construction in June 2007. Comparatively, a monitoring sample costs approximately $15/sample/grid. Even if a sample was required for every acre of the site, the cost would be less than $200,000. If needed, areas of the Project site could be potentially utilized for a pilot test of the mixing method proposed above depending on the site availability per the land exchange agreement with Tesoro Groves, L.P. Until directed otherwise, the Project Team will proceed with the assumption that the 1,600 acres of impacted soils will need to be moved to the perimeter of the project site and stockpiled.

Operation and Maintenance Costs

Estimated annual Operation and Maintenance costs for the first three years of project operation were presented in the BODR. These costs have not changed appreciably since the final BODR was submitted on April 14, 2006.

Life Cycle Costs

Since the OPCC developed for this phase of the project did not change significantly from what was presented in the final BODR, it follows that there has been no appreciable change in project life cycle costs.

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TABLES

Table 10.1
Opinion of Probable Construction Cost

Project Facility	Description	Direct Cost	Sales Tax	Field GC Mob/Demob	Contractor Fee	Bonds Ins	Undefined Scope	Current Construction Estimate Total
Reservoir Construction	Embankment Dike West Seepage Canal Access Road	64,759,984	2,713,289	5,828,399	10,995,251	1,264,454	12,834,207	98,395,584
Reservoir-Temp. Construction	Support Facilities	6,585,082	332,538	592,657	1,126,542	129,552	1,314,956	10,081,327
Reservoir- Discharge	Reservoir Overflow and Gated Decant	1,088,645	7,328	97,978	179,093	20,595	209,046	1,602,686
Reservoir- Intake Canal and Entrance Road	Excavation, sodding, grassing, rip rap, road fill, and pavement	16,220,004	587,397	1,459,800	2,740,080	315,109	3,198,359	24,520,749
Reservoir -TIWCD Permanent	Temporary reconfiguration during construction and TIWCD PS	2,147,866	94,442	193,308	365,342	42,014	426,446	3,269,418
STA Construction	STA Dikes Collection Canal Influent & Effluent Facilities FPL Access	46,661,009	1,426,333	4,199,491	7,843,025	901,948	9,154,771	70,186,577
Reservoir PS –water cooled Electric Drivers	All CSI divisions of construction including engineered process equipment	18,219,153	673,802	1,093,149	2,398,332	335,767	3,408,030	26,128,233
Easement Construction	All CSI divisions of work related to project improvements	4,169,128	101,370	375,222	696,858	80,139	813,408	6,236,125
Test TIWCD Reconfiguration	Early test of temporary TIWCD reconfiguration	599,915	9206	53,992	165,778	12,433	84,132	925,456
	Construction Cost Total	**160,450,786**	**5,945,705**	**13,893,996**	**26,510,301**	**3,102,011**	**31,443,355**	**241,346,155**

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Table 10.2
Total Project Budget

Description	Dollar Value	Current Project Budget	Clarifications
Phase 1	$2,251,549		Actual
BODR	$6,536,701		Actual
Preliminary Design	$3,176,303		Does not include permitting
Intermediate Design	$2,300,000		Does not include permitting
Final Design	$2,200,000		Includes Efforts Through Bid Opening
Permitting	$1,341,588		
Labor and Coordination	$3,494,924		
Plans & Specifications Subtotal	$21,301,065	$21,301,065	Unchanged
Non-Copper Remediation	$1,199,277		Efforts Performed in 2006
Supplemental Site Assessments	$560,000		
Copper Remediation	$8,500,000		See Volume 1 – Section 10
Interim Land Management Subtotal	$10,259,277	$2,467,414	Over Budget Due to Copper Remediation
Test Cell Construction	$10,974,916		Includes Construction Management and Engineering During Construction
Temporary Reconfiguration of TIWCD	$925,456		Includes Construction Management and Engineering During Construction
Tree Clearing	$0		Efforts Included in Land Acquisition
C-44 Reservoir/STA Construction	$240,420,699		$2 million less than previous estimate
MCIP	$9,653,845		4% of Construction Budget - Not Included in Previous Budget Estimates
Construction Coordination Budget	$28,500,000		
Engineering During Construction	$17,100,000		
Labor & Coordination	$633,221		
Construction Subtotal	$308,208,137	$316,000,000	
TOTAL	$339,768,479	$339,768,479	Anticipated Budget Reduction of $10 million Offset by Copper Remediation and OCIP

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